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FURTHER STUDIES WITH CEREAL HAYS IN W.A.

By

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During the last two decades, there has been a steady decrease in the amounts of cereal hay conserved in W.A. Over the same period, there has been a marked decline in the numbers of horses and a marked increase in the numbers of sheep maintained in the agricultural areas. The position for the years 1929–46 is shown graphically in Figure I., using figures taken from the Statistical Register.

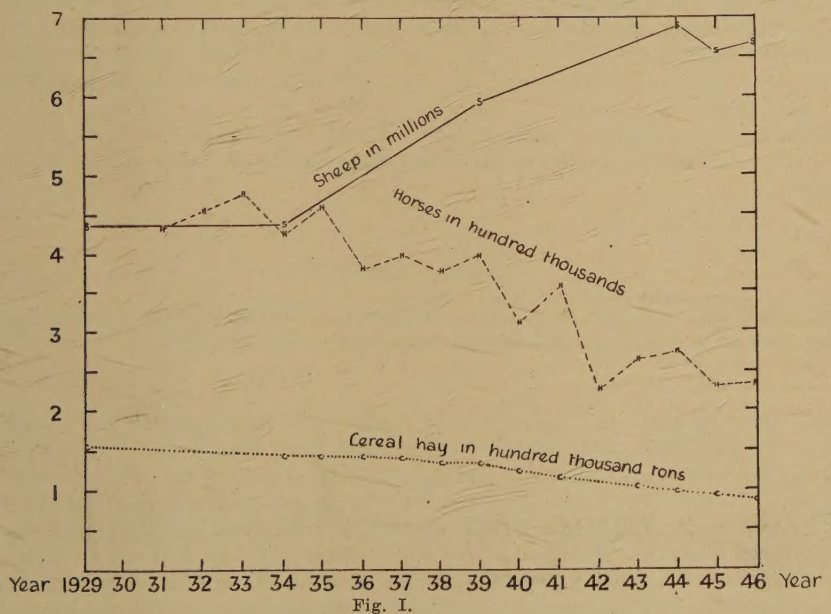

Fig. I.

These changes are of great significance in any considerations of fodder conservation practices. Sheep, unlike horses, are seldom housed and normally have access to ample "roughage" of varying quality in the paddock. Only in excep-

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tionally dry years or unusually prolonged dry summers will there be insufficient roughage for their needs. The most desirable addition to their diet during the summer months is, therefore, a concentrate. The cheapest and most readily available concentrates for this purpose are the cereal grains. Moreover, these grains are relatively good sources of digestible protein, besides being "energy" concentrates. Digestible protein is seriously lacking in most wheat-belt summer grazings.

Cereal hays, on the other hand, are exceedingly poor sources of digestible protein when cut at the stage of maximum yield of digestible dry matter or later. This fact was stressed by Underwood and Moir (1944), who found that wheaten and oaten hay cut at this stage contained insufficient digestible protein to supply even the maintenance requirements of adult sheep consuming the hay to the limit of appetite. If rapid wool growth is to be maintained, the protein intake of sheep must be considerably higher than the level for maintenance (Stewart and Moir, 1942).

These facts raise a number of very important questions concerning the relative value to the farmer of conservation of hay or grain, particularly in terms of yields of available nutrients per acre. Added significance is given by the high degree of mechanisation in the conservation of bulky fodders now possible, following the recent development of new and highly effective machinery for this purpose. This machinery is expensive and it is obviously essential, therefore, that conservation practices should be evolved which will use it to maximum advantage.

It is an unfortunate fact that, in spite of a considerable volume of Australian literature, extolling the virtues of fodder conservation, little or no experimental data are available on these important matters. Nor is there any information on curing losses with cereal hays and the factors which influence these losses, apart from the single experiment of the authors (Underwood and Millington, 1944). Experiments were therefore carried out at the Merredin Research Station in 1944 and 1945, with the hope that some useful information on these points would be obtained.

CURING LOSSES.

Experiments designed to measure the losses in curing hay for varying periods in the stook were conducted at Merredin with Mulga oats in 1944 and Charter Wheat in 1945.

In each instance, the experimental design was superimposed on a uniform crop grown on fallow and planted with normal farm machinery. A randomised block layout with four treatments and six replications was used. The whole of the plots were cut with the binder on the same day at the optimum time for hay (two to three weeks after full bloom, in this district) in both 1944 and 1945, and stooked in the normal manner. The yield of dry matter from each plot at the time of cutting, was obtained by calculation from the weight of green material and the dry matter content determined from samples transferred to the laboratory. At varying periods after cutting, the cured hay from a set of plots was weighed, chaffed and sampled for dry matter determination. From this data, the losses of dry matter which occurred during the different curing periods were obtained.

In Table I., the results are presented as percentage losses of dry material. Each figure in the table is the mean of six separate determinations.

TABLE I.

PERCENTAGE LOSSES OF DRY MATTER IN CURING CEREAL HAY.

Year.	Period of Curing (from the Time of Cutting).			
	3 weeks.	7 weeks.	11 weeks.	15 weeks.
	%	%	%	%
1944 (Oats)	4·2	6·0	6·0	7·6
1945 (Wheat)	0·4	1·0	2·1	4·2

It is apparent from Table I., that the losses of dry matter in curing oaten and wheaten hay under the conditions of 1944 and 1945 at Merredin, were exceedingly small. In fact, only in the case of the oaten hay remaining in the stooks for four months were the losses statistically significant. This is very different from the results obtained by the authors with wheaten hay at Avondale Research Station in 1941, when an average loss in curing of 18 per cent. occurred and is in marked contrast to the large losses mentioned by overseas workers. Thus Watson (1939), gives the average losses in making meadow hay, without special appliances, as 22 per cent. for dry matter, 44 per cent. for starch equivalent, and 34·6 per cent. for digestible crude protein.

The absence of significant losses of dry matter in the Merredin experiments, was probably due to the very favourable conditions for rapid curing and the absence of any heavy falls of rain during the curing periods. In the 1941 experiment at Avondale, a number of falls of rain occurred, while the hay was curing. The relevant rainfall data are given in Table II.

TABLE II.

RAINFALL DURING CURING PERIODS.

Station.	Year.	September.		October.		November.		December.		January.	
		No. of wet days.	Points of rain.	No. of wet days.	Points of rain.	No. of wet days.	Points of rain.	No. of wet days.	Points of rain.	No. of wet days.	Points of rain.
Avondale ...	1941	*6	*87	4	27	5	35	3	20	...	...
Merredin ...	1944	...	...	†1	†6	...	...	2	24	...	...
Merredin ...	1945	...	...	‡3	‡8	4	7	3	26	1	2

* From date of *first* hay cutting on 10th September, 1941. † From date of hay cutting on 9th October, 1944. ‡ From date of hay cutting on 18th October, 1945.

Losses of total dry matter are obviously not the only consideration in the curing of hay. The possibility of a differential effect on particular nutrients could not be ignored, especially in view of the claim of Watson (loc. cit.), that the losses of available energy (Starch Equivalent) and digestible protein are much heavier than those of total dry matter, in the making of meadow hay under European conditions. This claim is supported by Axelsson (1941) in an analysis of Swiss, English, and Danish data. The chemical composition of the hay as cut, and of the cured hay after the different periods of curing, was therefore obtained for the 1944 experi-

ment. The mean results are presented in Table III. The figures for the hay as cut represent the average of individual samples from the whole 24 plots. The figures for the remaining treatments are from six plots in each case.

One-man automatic self-tying pickup baler.

TABLE III.

COMPOSITION OF OATEN HAY UNDER DIFFERENT CONDITIONS OF CURING.*

Percentage on dry basis.

Treatment.	Crude Protein.	Crude Fibre.	N-free Extractives.	Ether Extract.	Total Ash.	Calcium Ca.	Phosphorus. (P).
As cut	4·7	28·6	58·3	2·5	6·0	0·07	0·13
Cured 3 weeks ...	5·2	28·5	57·5	2·6	6·2	0·08	0·13
Cured 7 weeks ...	5·1	29·7	56·3	2·4	6·5	0·08	0·13
Cured 11 weeks ...	5·5	29·3	56·4	2·6	6·2	0·08	0·13
Cured 15 weeks ...	5·7	30·5	54·7	2·5	6·6	0·08	0·14

* We are indebted to officers of the W.A. Government Chemical Laboratory for these analyses.

The data in Table III. shows clearly that no marked changes in composition occurred during the curing process. Only in the case of hay remaining in the stook for four months were the changes statistically significant. Under these conditions there was a *fall* in the N-free extractives fraction, the most digestible portion of the hay, of only 3·6 per cent., accompanied by corresponding *rises* in crude fibre, crude protein and total ash of 2·0 per cent., 1·0 per cent. and 0·6 per cent. respectively. Although these changes are significant, they are extremely small and of negligible effect on the nutritive value of the hay. No digestibility determinations

were made but it is inconceivable that, with such small changes in composition, there were any serious losses in digestibility during curing. If Axelsson's (1943) claim, that every one per cent. increase in fibre reduces the overall digestibility co-efficient by 0·93 per cent., be taken, it will be seen that even the hay cured for four months is less than two per cent. lower in digestibility than the hay when first cut. The digestibility of the crude protein would actually be *higher* after curing for this period, in view of the relation of co-efficients of apparent digestibility for this constituent to total protein intake.

No chemical analyses of the wheaten hays from the 1945 experiment were undertaken in view of the negligible losses of total dry matter and the negative results obtained from the previous years work.

RELATIVE YIELDS OF HAY AND GRAIN.

An attempt was made at the Merredin Research Station in 1945, to measure the relative yields, in terms of total dry matter and digestible nutrients per acre, of grain and of oaten and wheaten hay cut at the flowering stage, at the "late-milk" to "early-dough" stages (two to three weeks after flowering) and when matured.

Baling meadow hay direct from the windrows.

A split plot design, involving three plots replicated six times, was used. A plot comprised one width of a 15-run disc drill, with the centre tube blocked, 10 chains long. Bungulla wheat was sown from one half of the drill and Ballidu oats from the other half. These varieties were chosen because their similar rate of development gives a comparable growth stage at each time of cutting. Before the initial cuts were made, the plots were reduced in length so that each sub-plot was one-twentieth acre in area. The crops were sown on fallow with normal rates of seeding and superphosphate application.

Each plot was cut with the binder at the appropriate time, weighed immediately the hay was cured and samples taken for moisture determination and other analyses after chaffing. Three representative sheaves were taken from each plot receiving the third treatment (*i.e.*, cut almost mature), weighed, threshed, in a nursery thresher, and the proportions of grain, straw and "cocky chaff" obtained. It was intended to carry out digestibility trials with sheep on the materials from each treatment, but this was found impossible owing to the demands of other work during war time. Also, unfortunately, several samples were destroyed by vermin before the required chemical analyses could be made.

The results are presented in a greatly simplified form in Table IV. Calculations of digestible nutrients were made from the chemical analyses obtained from the appropriate digestibility co-efficients of Underwood and Moir (1944) for the hay and from the "standard" digestibilities given by Morrison (1937) for the grain.

Table IV.

RELATIVE YIELDS OF GRAIN AND HAY CUT AT DIFFERENT STAGES.

Cut No.	Treatment.	Total Yields Dry Matter.	Total Digestible Nutrients.	Digestible Crude Protein.
		cwts. per acre.	cwts. per acre.	cwts. per acre.
A	Oats cut full bloom	34·1	...	1·4
C	Oats cut late milk to early dough stage	35·0	19·4	1·3
E	Oats cut practically mature	31·5	16·8	0·9
E (a)	Grain fraction of E	8·4	6·6	0·7
E (b)	Straw fraction of E	19·0	...	...
E (c)	"Cocky chaff" fraction of E	4·1	...	...
B	Wheat cut full bloom	36·0	19·8	1·1
D	Wheat cut late milk to early dough stage	36·9	20·6	0·9
F	Wheat cut almost mature	37·3	18·7	0·7
F (a)	Grain fraction of F	9·7	9·0	0·9
F (b)	Straw fraction of F	22·9	...	...
F (c)	"Cocky chaff" fraction of F	4·7	...	...

The total yield of grain, of dry matter of the hay, and of digestible nutrients, was slightly higher for the wheat than for the oats, at each growth stage. The grain, in each case, represented about 25 per cent. of the total yield—a ratio of straw and chaff to grain of 3 : 1. A ratio nearer 2 : 1 is more usual under Merredin conditions. The actual yields of grain were 18 bushels per acre for the oats and 21 bushels per acre for the wheat, on a 10 per cent. moisture basis.

A point of considerable importance is that the yield of total digestible nutrients from the hay underwent little change from flowering to maturity in the case of the wheat. The fall from the "optimum" hay-cutting stage to maturity in the case of the oats was due very largely to the effects of one replication. The position in regard to protein was rather different. There was a marked fall in yield of digestible protein at maturity compared with earlier growth stages. These results are essentially similar to those obtained in the earlier trials of Underwood and Moir (*loc. cit.*).

A further point which emerges from the data of Table IV. concerns the relative yields of hay and of grain. As mentioned earlier, the grain yield with both the oats and wheat in these experiments was only about 25 per cent. of the hay. This

disparity is improved appreciably when the yields of total digestible nutrients are compared, owing to the much higher digestibility of grain. In terms of digestible protein, the position was still better. With the oats the yield from the grain was nearly 80 per cent. of that of the mature hay. With the wheat there was actually more *digestible* protein obtainable from the grain than from the mature hay. That this is largely a reflection of the very high digestibility of wheat grain protein (84 per cent.) compared with mature wheaten hay protein (30 per cent.) is shown by the fact that the yields of *total* protein were as follows:—Hay, 2·3 cwt. per acre ; grain, 1·1 cwt. per acre.

DISCUSSION.

It is clear that the losses of dry matter in the curing of cereal hay in the stook are negligible under typical wheat-belt climatic conditions, *i.e.*, without appreciable falls of rain during the curing period. Nor is there any measurable effect on chemical composition under these conditions. This makes it highly probable that there is no significant fall in digestibility since there is no appreciable loss of the most digestible portions of the hay. In other words, practically the whole of the nutritive value in the standing crop as cut can be conserved as hay.

It is apparent further that, under the climatic conditions described, delaying hay-cutting from the "optimum" stage until maturity results in relatively small losses of dry matter or of total digestible nutrients. Neglecting for the moment the serious losses in digestible protein there, therefore, seems to be little economic gain in earlier cutting. In the past, practically the only equipment available on wheat-belt farms for haymaking has been the binder and the cutting, stooking, and stacking of bound cereal hay has been a costly process in both time and labour. The recent development of the Pickup-baler offers new opportunities for economically conserving pastures and crops, where the amounts of fodder conserved are sufficiently large to "spread" the heavy capital costs of the machinery. In addition, some Pickup-balers are equipped with a cutter-bar which enables the standing crop to

Cutting and baling straw.

be cut. With such machines it is possible to cut and bale a *mature* cereal crop in one operation, which greatly simplifies the conservation of a good cereal roughage and greatly extends the period over which such roughages can be conserved.

It might be argued that, in spite of the very great advantages of conserving hay in this way at the mature stage, there would be a serious lowering in palatability to sheep, and hence the hay would be very wastefully used. In our experience, there is no appreciable difference, in palatability to sheep, between early cut or mature oaten or wheaten hays, when such hays are fed chaffed. On the other hand, Gross (1947) found that the more mature hay was when cut, the lower was its palatability to sheep. In these experiments it should be noted that the hay was fed as loose sheaves, giving ample opportunity for the sheep to reject straw and select "heads." When cut and pressed into bales, as with a Pickup-baler, there would be less opportunity for such selective feeding and also smaller losses of grain due to handling, in comparison with mature hay conserved and fed to sheep in the ordinary way.

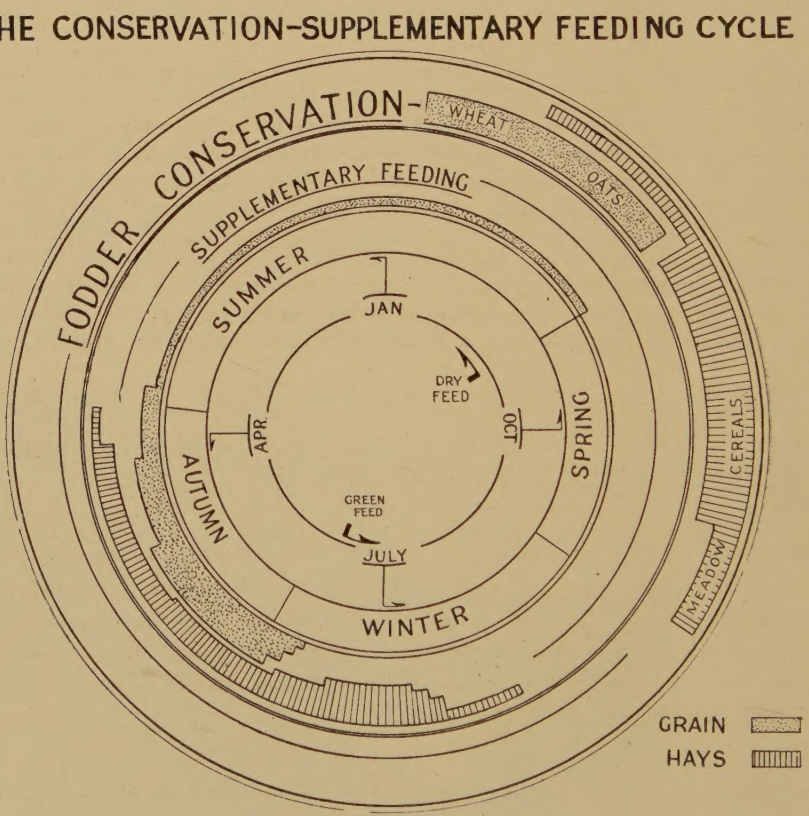

Fig. II.

Hay cut at maturity would ordinarily be much lower in carotene, or Vitamin A potency, than earlier cut hay, but it is very doubtful if this is of much practical significance. The reserves of Vitamin A in the livers of sheep at the end of the "green-feed" period of the year are apparently sufficiently high to prevent deficiency symptoms appearing during summers of normal length (Underwood & Conochie, 1941; Pierce, 1946; Underwood, 1947).

The results of the comparisons of hay and grain yields appear to provide powerful support for a programme of fodder conservation based very largely on hay. But the very much heavier yields of dry matter in the form of hay and, to a lesser extent, of total digestible nutrients, are not the only considerations. Cereal hay, cut at any reasonable growth stage, is a roughage of low digestibility and very low content of digestible protein. Grain, on the other hand, is a concentrate particularly well adapted for supplementing the poor dry grazing of the summer months. Moreover, as pointed out earlier, its digestible protein content is much higher than hay, and protein deficiency is probably the most important limiting factor in sheep husbandry at this time of the year.

With these points in mind, an attempt can be made to outline a satisfactory yearly programme of fodder conservation and supplementary feeding on a Western Australian wheat-belt farm. Such a programme is illustrated diagrammatically in Figure II.

In the late summer and autumn (March to early June) the normal rapid decline in both the quantity and quality of the available grazing necessitates hand-feeding of sheep. This should commence with a cereal grain and not a roughage such as hay, for the reasons given above. With the approach of lambing the grain supplement could well be as high as ½ lb. to ¾ lb. per day, to reduce the chances of pregnancy toxaemia (twin lamb disease) in the ewes and losses of lambs at lambing time. At this time, cereal hay or chaff should be fed in addition to the grain. With the advent of winter rains and supplies of young green feed, the grain supplement should be reduced and soon eliminated but the hay supplement continued to enable the young herbage to be used more efficiently. Cereal hay is the logical supplement to the young green grazing available at this time of the year. With increasing bulk of pastures no further supplementary feeding will be necessary.

Conservation will commence in September with the volunteer pastures of grass and weeds as meadow hay, followed by the cereals. With the use of modern hay-making machinery, in the manner described earlier, not only can hay-making be greatly reduced in cost but the period of conservation greatly extended. The conservation programme will be completed with the cutting and baling of the mature cereal crop and finally the harvesting of grain.

So far, the discussion has been confined to wheat and oats. The development of the hooded feed barley, "Greenough," directs attention to the possibilities of this cereal and, incidentally, to a very neglected field of cereal breeding. The hooded barleys lack the barbed awns which make the common varieties of this cereal unsuitable for hay. "Greenough" withstands adverse pre-harvest weather much better than oats, and is an early-maturing variety developed primarily for the outer wheat-belt. Slightly later maturing varieties of barley would be attractive alternatives to oats for fodder in the more favoured regions.

Cutting and baling straw.

SUMMARY.

Experiments were carried out with oats and wheat at the Merredin Research Station in 1944 and 1945, to measure the losses in the curing of hay and to compare the yields of grain and of hay cut at different growth stages.

Under the curing conditions prevailing in these years, *i.e.*, in the absence of any substantial falls of rain, it was found that :—

(i) Losses of dry matter during curing, up to four months in the stook, were negligible for both the wheat and the oats.

(ii) No appreciable changes in chemical composition occurred during curing of the oats, from which it was concluded that there was no significant loss of digestible nutrients. (In view of this finding similar chemical analyses were not carried out with the wheat.)

(iii) The decline in yield of total dry matter and of total digestible nutrients between wheaten and oaten hay cut at the " optimum " growth stage and at maturity was relatively small but there was a serious fall in yields of digestible protein.

(iv) The yields of total dry matter of mature oaten and wheaten hay was nearly four times as high as the yields of grain and the yields of total digestible nutrients more than twice as high.

(v) The yield of *digestible* protein from the oats grain was nearly 80 per cent. of that of the mature oaten hay and from the wheat grain nearly 130 per cent. of that of the mature wheaten hay. Half the *total* protein of the mature hay was found in the grain in each case.

The significance of these findings in relation to fodder conservation practice in the Western Australian wheat-belt is discussed, with particular reference to the decline in horse numbers and rise in sheep numbers and to the use of modern hay-making machinery.

A fodder conservation-supplementary feeding cycle for wheat-belt farms is presented.

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THE MANGANESE CONTENT OF WESTERN AUSTRALIAN CEREAL GRAINS AND THEIR BY-PRODUCTS AND OF OTHER POULTRY FEEDS

By

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INTRODUCTION.

Manganese appears to be of little practical importance in the diet of mammals because their requirements are exceedingly small and the amounts supplied by ordinary foods are invariably greater than the animals' requirements. No naturally occurring deficiencies of this mineral have so far been recorded for grazing animals, although manganese deficiency affecting the growth, health and manganese content of a number of crops, and particularly oats, barley and wheat, has been observed in many countries including Australia. In the nutrition of poultry, on the other hand, there is ample evidence that manganese is a " trace " mineral of great practical and scientific importance.

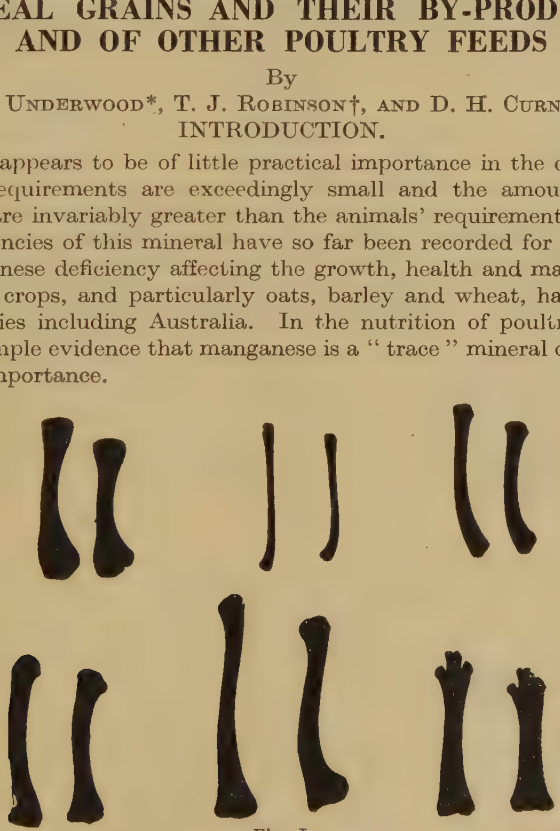

Fig. I.

Leg and wing bones of chicks four weeks old, showing the effects of manganese deficiency. (Caskey, Gallup and Norris, 1939.)

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The first report that poultry require manganese came from the American workers Wilgus, Norris and Heuser (1936), who demonstrated that the disease "perosis," "slipped tendon" or "hock disease" can be caused by a deficient dietary intake of manganese and can be prevented by the addition of manganese supplements. Hock disease is a leg abnormality of young growing chicks in which the bones of the legs, particularly the tibia and metatarsus, become deformed causing the tendons to slip off the "hock" joint and making it difficult or impossible for the chicken to stand. (Figure I.)

This outstanding finding has been confirmed and extended by numerous workers and it is now known that, besides causing "perosis" and inferior growth in growing chicks, manganese deficiency in laying hens results in lowered egg production, reduced hatchability and a remarkable condition in the chick embyros, known as "nutritional chrondrodystrophy." In this condition the embyros are undersized and deformed with large globular heads, parrot beaks and short thick legs and wings (Lyons and Insko, 1937). (Figure II.)

Fig. II.

Numbers 1 to 5 chick embryos (21 days) showing chondrodystrophy due to manganese deficiency in the diet of the hen. Note the very short legs, "parrot beak," globular head and protruding abdomen. Number 6, normal 21-day embryo. (Lyons and Insko, 1937.)

The minimum level of manganese in the diet of birds to prevent these disorders and to sustain optimum growth, egg production and hatchability cannot be stated exactly because it has been shown to be influenced by :—

(*a*) the overall calcium, phosphorus and iron contents of the diet,

(*b*) the chemical nature of the manganese supplement used (if any),

(*c*) the breed or even "strain" of fowl.

Thus, abnormally high intakes of calcium and phosphorus have been shown to raise the manganese requirements appreciably. In fact, "perosis" was believed at one time to be caused by an excess of these minerals and it was by a critical study

of this hypothesis that the original discovery of a manganese deficiency was made. For all ordinary sources of manganese likely to be used as supplements, there appears to be little difference in availability, and hence of requirements in terms of total manganese, but some compounds have been shown to be poor sources (Schaible et al, 1938). The "lighter" breeds of fowl appear to have a lower manganese requirement than the heavier breeds. Thus Gallop and Norris (1937 and 1939) found that about 30 parts per million of manganese on the whole diet was sufficient to prevent perosis and for normal growth in their strain of White Leghorns, whereas about 50 parts per million was required for their New Hampshires.

Under average conditions of feeding, however, it can be stated with some confidence that the whole ration should contain not less than 40 parts per million if it is to supply adequate amounts of manganese. The figures given by most authorities range from 30 to 50 parts per million, both for growing chicks and laying and breeding hens, the lower figure approximating the requirement of the "lighter" breeds and the higher figure approximating that of the heavier breeds.

Prior to the commencement of the present work, little or no information was available on the normal manganese content of Australian cereal grains and other poultry feeds. Cases of perosis and chrondrodystrophy have been reported from time to time in W.A., and low hatchability of unknown cause is a fairly common problem throughout Australia. It was therefore thought worth while to initiate a study of the manganese content of a range of W.A. poultry feeds and in particular, of the cereal grains and their by-products. In this way, it was hoped to obtain data which would enable an appraisal to be made of the manganese intakes of birds under a range of feeding practices.

Further point has been given to this study by the increasing popularity of "whole-grain feeding," following experiments at Werribee (Pederick and Clark, 1943, 1944, 1945) in which bran and pollard were eliminated from the experimental rations. Overseas workers (Schaible et al, 1938), have shown that the manganese of cereal grains is largely concentrated in the outer layers. Thus the average manganese content of wheaten grain is given by these workers as 31 parts per million, of wheaten bran, 108 parts per million, and of middlings or pollard, 101 parts per million. Titus (1941), gives 39, 119, and 119 parts per million for American wheat, bran and pollard respectively. If these figures are at all comparable with those of Australian grown grains and their by-products, it follows that any system of feeding which avoids the use of bran and pollard, will result in a reduced manganese content of the ration, possibly to the extent of affecting the growth or productivity of the birds or the hatchability of their eggs.

The possible importance of such changes in practice with respect to manganese (and riboflavin) and their relation to hatchability has recently been pointed out by McClymont and Hart (1946, 1947) in N.S.W. These workers carried out an experiment with White Leghorn pullets demonstrating improved hatchability of eggs when supplements of both manganese and riboflavin were added to a ration based on wheat but containing no bran or pollard. From the experiments actually reported it is not clear whether the improved hatchability is due to the additional manganese or the riboflavin but from the nature of the symptoms in the dead embyros produced on the low hatchability rations and from the results of further experiments (not reported in detail), these authors conclude that riboflavin deficiency and not manganese deficiency is the cause of the low hatchability and abnormalities in the chick embyros. The unsupplemented low hatchability rations in their experiments supplied 40 to 42 parts per million of manganese which, on American standards, can be regarded as adequate for a "light" breed such as the White Leghorn.

AIMS AND METHODS.

The primary object of the investigation was to find out the manganese content of a wide range of W.A. grown poultry feeds so that a fairly complete picture could be obtained of the manganese intake of poultry under the various systems of feeding practised. A further aim was to obtain similar data for a large number of samples of wheaten grain, which is the basis of poultry feeding throughout Australia, from throughout the State to gain some idea of the degree of variability in manganese content and the relation of this variability to season, district, variety, and soil type.

Accordingly, wheat samples were obtained in the 1940–41 delivery season from sidings at nearly 200 places widely spread throughout the wheat belt of W.A. (see map page 264). In most cases, the varieties were known and recorded and in a few cases, the soil type on which the wheat was grown was also known. In addition, samples of the official F.A.Q. wheat samples for the eight years 1937 to 1944, were also obtained as was a selection of wheat, barley and oats grown in different years at the Research Stations of the Department of Agriculture.

Samples of bran and pollard were obtained from six mills situated in different parts of the State. Samples of meatmeal, lucerne, elephant grass, and oyster shell, were obtained from individual poultry producers or from produce merchants in Perth.

The method of analysis for manganese used on most of these samples was essentially that given by Piper (1944). Owing to temporary shortage of potassium periodate, oxidation with ammonium persulphate had to be resorted to with some of the samples. By careful precaution, comparable results with those given by Piper's method were obtained.

RESULTS.

Wheat, Pollard, and Bran.

The results of the analyses of wheat, bran and pollard, expressed as parts per million (p.p.m.) of manganese on the dry basis, for the whole of the samples collected in the 1940–41 delivery season are given in Table I.

Table I.

MANGANESE CONTENT OF WHEAT, BRAN AND POLLARD (1940–41 SEASON, W.A.).

Parts per million on dry basis.

	Wheat	Pollard.	Bran.
Number of Samples	208	24	23
Mean	37	100	133
Standard Deviation	8·3	13·9	13·6
Range	19–84	62–118	114–168

It is apparent from Table I. that manganese is heavily concentrated in the outer layers of the grain and that both bran and pollard can be regarded, on the average, as rich sources of this mineral. The mean levels of manganese found in wheat, bran, and pollard are closely similar to those found by the American workers, cited earlier, for similar materials of American origin.

The range of values obtained was very large, in each case, particularly for the wheat. The distribution of the wheat samples over the range of values is shown in Table II.

TABLE II.

MANGANESE CONTENT OF WHEAT (1940–41 SEASON).

Manganese Content (ppm)...	15-19.	20-24.	25-29.	30-34.	35-39.	40-44.	45-49.	50-54.	Over 55
Number of Samples ...	2	14	24	49	43	41	20	11	4

The number of very low and of very high values is an extremely small proportion of the total number of samples analysed. Eighty-five per cent. of the samples lie within the range 25–49 ppm. and 65 per cent. within the range 30–44 ppm. It is noteworthy, however, that there is no "peak" of samples around the mean figure of 37 ppm. Actually, more samples lie within the range 30–34, and almost as many within the range 40–44, as occur in the "mean" range of 35–39 ppm.

The Influence of Variety.

Except for a few samples the actual variety of wheat was known in each case. It was therefore possible to examine the results for the different varieties separately. Different varieties of wheat, oats, and barley have been observed to vary greatly in their degree of tolerance of, or susceptibility to, manganese deficiency (Davies and Jones, 1931, and Leeper, 1934) but no data on the influence of variety on the manganese content of grain grown under comparable conditions have been presented as far as is known.

The mean manganese content, together with the standard deviation in each case is presented for the five main varieties in Table III. These together comprise three-quarters of the total samples for which the variety was known and have a wide distribution throughout the wheat-growing areas. A useful comparison can thus be made, although it must be emphasised that soil, cultural and even seasonal conditions vary widely and not necessarily in the same way within each variety.

TABLE III.

MANGANESE CONTENT OF WHEAT VARIETIES.

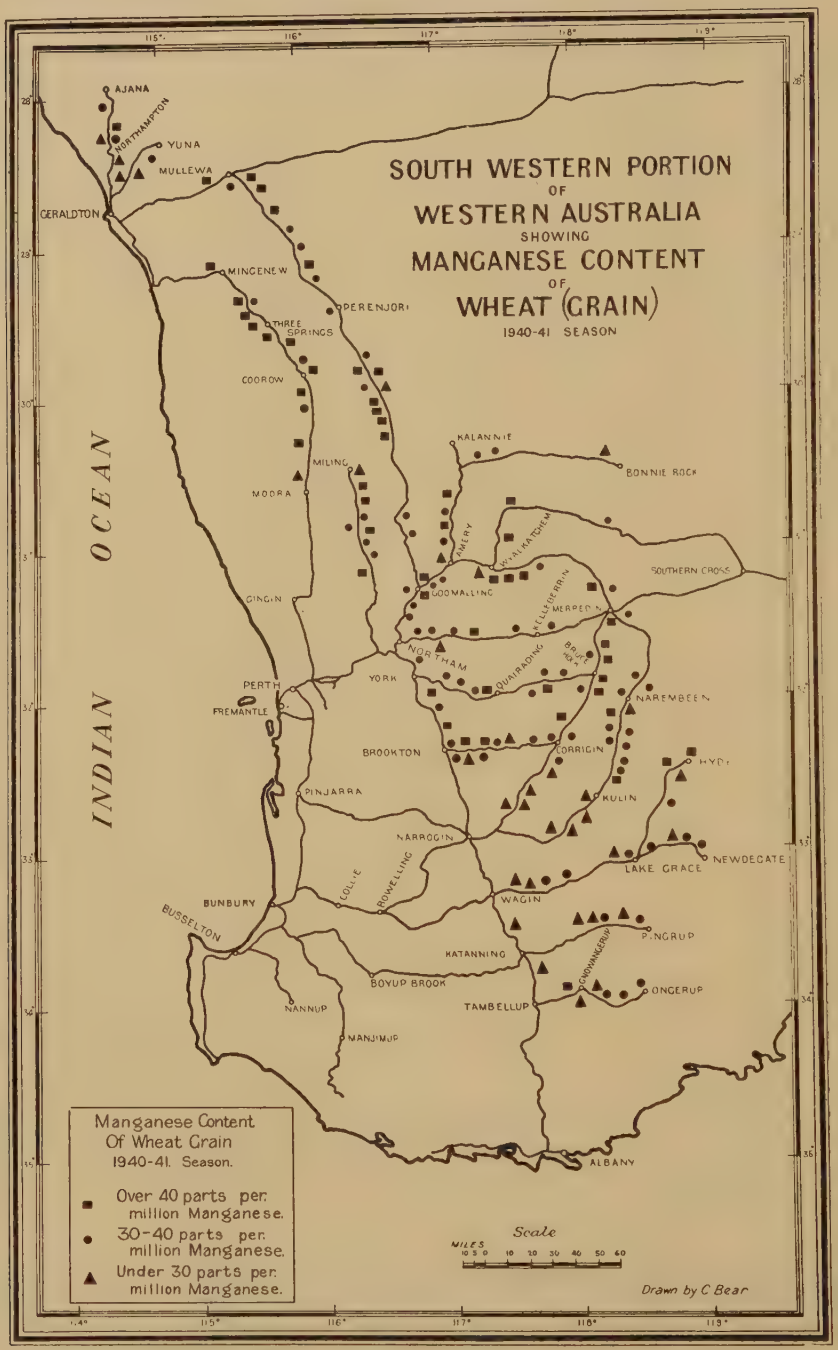
(*Ppm on dry basis.*)

Variety.	Bencubbin.	Gluclub.	Dundee.	Nabawa.	Ranee.
Number of Samples ...	61	36	16	14	11
Mean	35·7	33·9	36·7	38·3	39·6
Standard Deviation ...	8·4	8·3	7·1	6·4	6·6

The small differences in the mean manganese contents of the five varieties are not significant when examined statistically. Evidently under the range of conditions represented by these samples variety is not an important factor influencing the manganese content of wheat grain.

The Influence of District.

The wheat samples were obtained from practically the whole of the wheat belt so that if there were any marked differencees between districts these should be revealed. It was felt that the simplest way of doing this was to plot the results on a map. Accordingly, the results have been divided into three arbitrary groups according to their manganese content, those containing over 40 ppm. being in one group, those containing 30–40 ppm., being in another and the third group consisting of those samples con taining less than 30 ppm. The distribution of the various samples comprising these groups is shown on the accompanying map.



High and low manganese samples, as well as those in the "middle" group containing 30–40 ppm., appear in practically every district. There is, however, a noticeable concentration of samples containing less than 30 ppm. in the south-eastern parts of the wheat belt, *i.e.*, in the districts east of Great Southern at Narrogin,

Wagin and Katanning. In fact one half of the total samples in this group were obtained from these districts. It is very probable that this is a reflection of the soils of this area. Manganese deficiency in cereals and yield responses to manganese fertilisers have been reported on the ferruginous gravelly sands of these districts by Wild (1934), Stewart and Teakle (1939) and Teakle and Wild (1940). It is likely, although no evidence can be presented on this point, that a lowering of the manganese content of the grain occurs on these and similar soils even where there is no marked crop failure or obvious symptoms of deficiency. On a soil type in Victoria, which induced acute manganese deficiency symptoms in cereals, a marked lowering of the manganese content of wheat grain was demonstrated by Leeper (1934).

The Influence of Season.

Unfortunately, the 1940 growing season was exceptionally dry throughout almost the whole of the wheat belt. It was felt therefore that the results for this might be either lower or higher than those for more normal seasons. Accordingly, the "official" F.A.Q. samples obtained by the Chamber of Commerce were examined for the eight years, 1937–38 to 1944–45. The results are presented in Table IV.

TABLE IV.

MANGANESE CONTENT OF F.A.Q. WHEAT SAMPLES.

(*Ppm on dry basis*).

Year.	Sample.	Manganese Content.	Year.	Sample.	Manganese Content.
1937–38 ...	"Official" F.A.Q.	39	1941–42	"Official" F.A.Q.	46
1938–39 ...	do. do.	43	1942–43	do. do.	43
1939–40 ...	do. do.	47	1943–44	do. do.	44
1940–41 ...	do. do.	35	1944–45	do. do.	39
			Mean of 8 years		42

In so far as these samples are representative of the "average" wheat grown throughout W.A. in the different years it is evident that there is an appreciable effect of "season" on the manganese content of the grain. The very dry year, 1940, produced a grain significantly lower in manganese than the other years and very appreciably lower than the years immediately preceding and immediately following. In both of these years the growing season was one of above average rainfall for most of the wheat belt. The figure obtained for the 1940–41 F.A.Q. sample, namely, 35 ppm., is very close to the average of 37 ppm. obtained for the 208 samples analysed from throughout the wheat belt in this year. From the mean of the eight years, however, it would appear that 42 ppm. is nearer the "average" manganese content of W.A. wheat grown in an "average" season. This is much higher than the figure of 31 ppm. given by Schaible et al (loc cit) for American grown wheat, but not greatly different from the figure of 39 ppm. quoted by Titus (loc cit).

The Influence of Soil Type.

In most cases no information was available as to the type of soil on which the various samples were grown, although this information was asked for. In 19 cases, however, the farmer had definitely stated that his wheat came from either "heavy" forest country, "medium" timbered country or "light" treeless sand-plain. This classification of soils, based on the original vegetation carried, leaves much to be desired, although it has provided in the past a resonably good assessment of the inherent quality of the soils from the standpoint of cereal growing. The results are therefore presented for what they are worth.

The mean manganese content of the wheats grown on the "heavy" soils was 43 ppm., that of the "medium" soil samples 48 ppm. and that of the "light" sand-plain soil samples 45 ppm. These differences are not statistically significant and in any case are too small in number to enable a satisfactory assessment to be made.

Manganese deficiency in cereals and other crops occurs particularly on some soils naturally alkaline in reaction or rendered so by very heavy liming. In this way the availability to plants of the soil manganese is lowered. Highly oxidising conditions also depress availability. Occasionally, also, manganese deficiency occurs in soils due to the extremely low absolute amounts of manganese present. Such soils have been described by Teakle, Hoare, and Thomas (1933) in the case of the lateritic "sand plain" soils of Wongan Hills. Many of the samples collected must have been grown on soils of this type, although in the case of the six samples in which this was actually known, there is no evidence of lowered manganese content of the grain as pointed out in the previous paragraph. However, a much larger number of samples would be required before any effect could definitely be established.

BARLEY, OATS, AND MAIZE.

The results of the barley, oats, and maize samples collected from different parts of the wheat belt are presented in Table V. Maize is very little grown for grain in W.A., except on one or two properties in the irrigation areas, so that only three samples were obtained, all grown in 1945. Three N.S.W. grown samples are therefore included in the table. None of the barley and oats samples were grown in the 1940 season and are therefore not directly comparable with the main wheat samples presented in Table I. Most of them were obtained during the 1943–44 and 1944–45 delivery seasons.

Table V.

MANGANESE CONTENT OF BARLEY, OATS, AND MAIZE.

(*Ppm dry basis*).

	Barley.	Oats.	Maize.
Number of Samples	15	9	6
Mean	15	43	8·6
Standard Deviation	3·9	12·5	1·9
Range	9–23	27–62	6·5–11·6

It is apparent that barley, oats, and maize grain differ widely in their average manganese contents and that wide fluctuations exist within each type of grain. Oats compares closely with wheat and exhibits a similar range of values. Barley is obviously a much poorer source of manganese and maize is strikingly low. The mean values for barley and oats, and the range of values in each case, are very similar to the figures obtained by the American workers Schaible et al in 1938 and Titus (1941), cited earlier. Their mean figures were 14 and 16 ppm. for barley and 36 and 34 ppm. for oats. The values for maize presented in Table V., although very low are, however, much higher than the mean figures of 4·9 and 5·0 ppm. given by these workers. No significant differences between the W.A. and N.S.W. maize samples included in Table V. was found. The actual values obtained were as follows:—W.A.—7·7, 8·8, and 9·8; N.S.W.—6·5, 7·3, and 11·6.

MEATMEAL.

Eight samples of meatmeal, the most important protein supplement in poultry rations, were obtained from merchants in Perth during the years 1941 to 1945. The mean manganese content of these samples was 20 $\pm$ 1·8 ppm., with a range from

11 to 25 ppm. This is extremely close to the average figure of 18 ppm. given for meatmeal and tankage by Schaible et al (*loc. cit.*). Apparently protein concentrates of animal origin are not normally particularly good sources of manganese.

GREEN FEEDS.

A considerable volume of data is available on the manganese content of pasture grasses, clovers, and cereals. The manganese content has been shown to vary widely with the species and especially with the nature of the soil on which the plants are grown. Thus Beeson (1941) in U.S.A. gives a range for 86 samples of clover of 18·5 to 875 ppm., with an average of 145 ppm. of manganese. Teakle and Turton (1943) found 93 samples of Subterraneum clover leaves grown in various parts of W.A. to range in manganese content from 26 to 298 ppm. on the dry basis and 33 samples of young oats, wheat, and barley to range from 22 to 325 ppm.

Poultry normally consume much less green feed than most other classes of livestock. In W.A., however, either green chopped lucerne (*Medicago sativa*) or green chopped Elephant grass (*Pennisetum purpureum*) frequently forms a regular part of poultry rations. Accordingly, samples of these materials were collected from commercial poultry raisers in the main poultry producing areas near Perth. The results are presented in Table VI.

TABLE VI.

MANGANESE CONTENT OF LUCERNE AND ELEPHANT GRASS.

(*Ppm dry basis*).

	Lucerne.	Elephant Grass.
Number of Samples	9	6
Mean	26	48
Standard Deviation	8·1	35·1
Range	9–67	17–110

The tremendous range of values found for each species confirms existing evidence, including that just quoted, demonstrating the great variability which can occur in the manganese content of whole plants. Under these conditions average values are almost worthless. It is apparent, however, that even the high values of Table VI. are insufficient, at the levels at which green feed is normally fed, to raise appreciably the overall manganese content of the ration.

DISCUSSION.

Overseas workers have, as pointed out in the introduction, established conclusively that poultry require about 40 ppm. of manganese on the dry basis in their whole diet if they are to grow properly and remain healthy and for maximum production of normal eggs of good hatchability. It must be emphasised that this level of 40 ppm. is only an average figure. There is evidence that a slightly lower level of manganese is sufficient for the "lighter" breeds, such as the White Leghorn, and also evidence that a considerably higher level is necessary where the rations contain large amounts of bonemeal or other calcium and phosphorous supplements. However, 40 ppm. can conveniently be taken as a basis for calculation of the adequacy or otherwise of diets made up from W.A. grown poultry feeds, the manganese contents of which have been presented above.

A serious difficulty in any such calculations is the great variability in manganese content which has been shown to exist within each class of foodstuff. This is particularly striking with the large series of wheat samples analysed which ranged in manganese content from 19–84 ppm. Variation of this order was also found, as would be expected, among the bran and pollard samples. Very great variation also occurred among the other cereal grains and also in the comparatively small number of "green feed" samples analysed. The results for the "green feed" samples are not surprising since many other workers, including Teakle and Turton (1943), quoted earlier, working in W.A. on Subterraneum clover and wheat, oats, and barley, have similarly found very large variations in the manganese content of whole plants. Such a large variation in the manganese content of grain is, however, surprising and remarkable in comparison with the variation commonly found with such "major" minerals as calcium, phosphorus, chlorine, etc. Further studies designed to elucidate the factors determining the manganese content of grains, as well as of whole plants, are badly needed.

Under these conditions it is obvious that the use of "averages" in calculating the manganese content of rations is rather a hazardous procedure. Nevertheless, certain facts seem fairly clear from the foregoing data. It is clear, for instance, that maize is invariably an extremely poor source of manganese for poultry and that barley, although not quite so bad, is also a very poor source. Where these grains comprise a high proportion of the ration, therefore, a manganese supplement is essential. This merely confirms for W.A. conditions previous American findings. It is apparent also that bran and pollard are invariably rich sources of manganese. Rations composed of appreciable proportions of these materials are unlikely to need additional manganese.

Calculations to support these statements seem hardly necessary but one example can be given. A "standard" ration, such as is fed to birds participating in the Muresk Agricultural College Egg-Laying Trials, composed of a "morning mash" of wheatmeal, bran, pollard, meatmeal, and bonemeal, plus chopped greenstuff in equal parts by *volume* of the mash (approximately 8 per cent. in terms of dry matter), together with whole wheat in the evening, contains an overall manganese content of about 65 ppm. on the dry basis. This figure was obtained by using the *average* manganese figures submitted above for W.A. grown feeds and an average overseas (U.S.A.) figure of 13 ppm. for bonemeal. This overall level is sufficiently high to allow for the considerable variations possible in the manganese content of the constituent feeds and renders the chance of deficiency very remote indeed.

Under conditions of whole grain feeding, on the other hand, and particularly where mixed grains including equal parts of wheat, oats, barley, and maize are fed, the position is very different. Thus substitution of average W.A. manganese figures in the rations consumed in the Werribee experiments reveals a manganese content of the whole rations of approximately 32 ppm. on the dry basis. This allows 40 ppm. for the green feed with a consumption at the rate of 5 per cent. on the dry basis of the grains consumed, but makes no allowance for the oyster shell. The American workers obtained some very high figures for the manganese content of some samples of oyster shell, but in W.A. no figure higher than 20 ppm. has yet been found for the few samples analysed. 32 ppm. of manganese on the whole ration is appreciably below the "safe" level of 40 ppm. quoted earlier, and in view of the great variability in the manganese content of the constituent feeds and the chances of many samples being much lower than the average figures used in arriving at this level, it is considered advisable to provide a manganese supplement wherever such rations are used. A convenient means of doing this is to incorporate ½ per cent., of finely ground manganese sulphate in the salt made available to the birds or mixed into the ground grains.

Where wheat only or wheat and oats is fed as the grain portion of the ration that is without barley or maize, the manganese position is more satisfactory owing to the higher average manganese content of wheat and oats compared with barley and maize. With such rations no manganese supplement would normally be necessary. This conclusion is supported by the hatchability experiments of McClymont and Hart (1946, 1947) reported earlier.

SUMMARY AND CONCLUSIONS.

The manganese content of a large number of Western Australian grown samples of wheat and its by-products bran and pollard, of oats, barley and maize, and of other poultry feeds is presented.

It was found that :—

(i) The mean manganese content of the "official" F.A.Q. samples of wheat for the eight years 1937–38 to 1944–45 was 42 parts per million (p.p.m.) on the dry basis. The figures ranged from 35 p.p.m. in the 1940–41 season, following an exceptionally dry year, to 47 p.p.m. in 1939–40 following an unusually wet year.

(ii) The mean manganese content of over 200 samples of wheat taken from centres throughout the wheat belt in the 1940–41 season was 37 p.p.m. The range of values was very large (19-84 p.p.m.) but 65 per cent. of these samples fell within the range 30–44 p.p.m.

(iii) There were no significant differences in the mean manganese content of the five main varieties of wheat, which together made up more than two thirds of the total samples.

(iv) High, medium and low manganese content samples of wheat occurred in practically every district in the wheat belt from which samples were obtained. A noticeable concentration of samples containing less than 30 p.p.m. occurred, however, in the districts east of the Great Southern railway at Narrogin, Wagin and Katanning, where manganese deficiency in cereals and yield responses to manganese fertilisers have been reported (see text) on ferruginous gravelly sands.

(v) Manganese is heavily concentrated in the outer layers of the wheat grain. The mean manganese content of 24 samples of pollard and of 23 samples of bran, obtained in 1941, was 100 p.p.m. and 133 p.p.m. respectively. The range of values in each case was large.

(vi) Oats, barley and maize grains differed markedly, on the average, in their manganese content. Oats contained a mean of 43 p.p.m., barley 15 p.p.m., and maize only 8·6 p.p.m.

(vii) Meatmeal was not a good source of manganese—eight samples averaged 20 p.p.m. and all fell within the range 11–25 p.p.m.

(viii) The manganese content of whole green plants of lucerne (*Medicago sativa*) and Elephant grass (*Pennisetum purpureum*) was extremely variable. Nine samples of the former ranged from 9–67 p.p.m. and six samples of the latter from 17–110 p.p.m. on the dry basis.

These results are compared with overseas data and their significance discussed in the light of present knowledge of the manganese requirements of poultry.

It is concluded that :—

(i) Where bran or pollard comprises a proportion of the daily "mash," rations composed of Western Australian grown feeding-stuffs will normally provide ample manganese to meet all the requirements of growing or laying birds.

(ii) Where a system of "whole-grain" feeding is practised, the manganese intake will probably be adequate in most cases when wheat or oats or both constitute the bulk of the grain fed.

(iii) Where barley or maize or both constitute 50 per cent. or more of the ration, under a "whole-grain" system, it is considered advisable to provide a manganese supplement to avoid the possibility of manganese deficiency. A cheap and convenient means of doing this is to incorporate half per cent. finely ground manganese sulphate into the salt made available to the birds.

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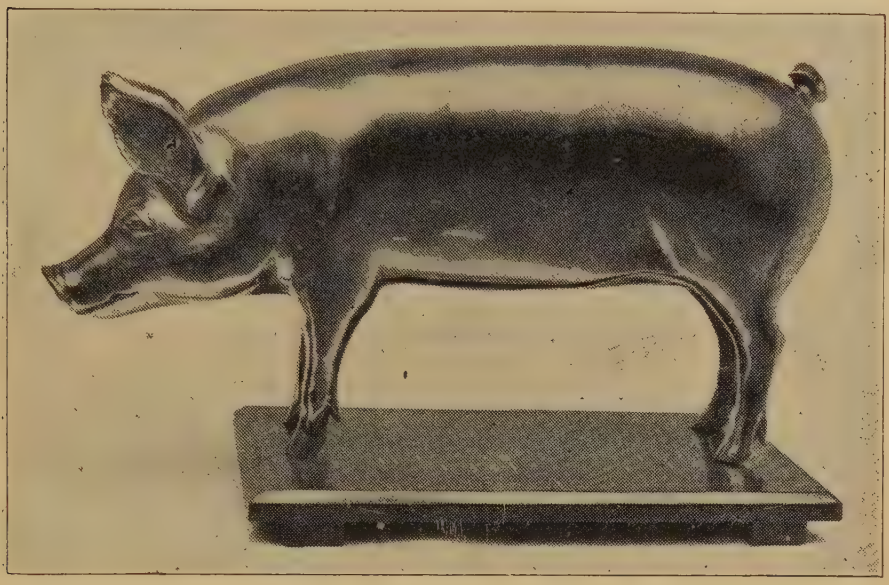
POINTS ON PROFITABLE PIG-RAISING.

V. B. Monti, Dairy Supervisor.

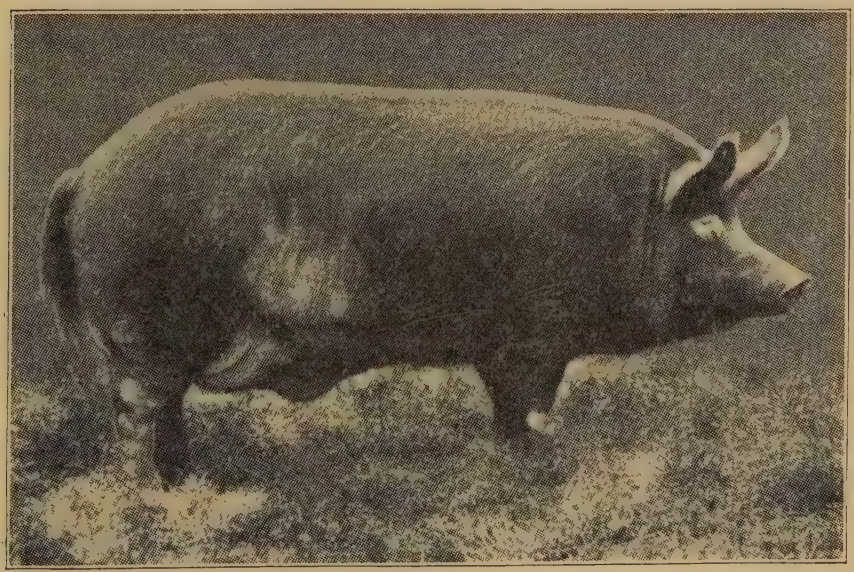
Today, with the high prices being obtained for pigs, it would appear that pig-raising is a lucrative side-line to any dairy farm, but the increased price on analysis is not so real, as is at first apparent, being offset by the high cost of wheat, protein supplements, construction materials and labour, so if a real profit is to be obtained, pig-raising must be treated as a science, and a careful analysis of management made. It is hoped the following notes may prove a useful guide in economical pig-raising.

The aim is to produce the right type of baconer, weighing 160–170 lbs. in six months. With present prices averaging over a shilling a pound, this pig is definitely profitable.



Model of Standard Type of Bacon Pig, in chrome-nickel, prepared by Western Australian Branch of Australian Pig Breeders' Association, as a guide to breeders and farmers in the selection of breeding stock for bacon production.

How is it to be obtained ? Firstly by breeding from the right type of pigs which have a family history of being economical converters of food to flesh. The pig is the most economical of all farm live-stock in the utilisation of food, requiring only 400-450 lb. of air dried food per 100 lbs. of live weight gain, compared with twice



Tamworth Boar. Improved type; note hams, capacious body, small head.

that figure in lambs and calves. It is reasonable, under proper conditions of selection and management to expect a live weight average gain of 1 lb. per day from birth to marketable age. So select from a line of proven "good doers."

As the boar is likely to leave upwards of 1,000 piglets during his useful life, too much emphasis cannot be placed on the acquisition of the right type of sire. Do not begrudge the 20 guineas that may have to be paid for a pure bred animal of that type. Points to be considered are light lean head, light jowl, light shoulder, well sprung ribs—avoid the animal pinched in behind the shoulder—long level back or slight arch permissible, large good quality hams, the rear appearance giving a decided "U" as against "V." The legs well placed and the pig standing upright, the bone of light, good quality and the hair relatively sparse and soft. Twelve good well spaced teats are always to be looked for.

A typical brood sow of the Improved Type Berkshire.

The points in selecting a sow are very similar to the above, but if possible always select sows from large litters of proven good mothers. It is useless a sow having a prolific capacity for the production of young unless she has the added attributes of motherhood in being able to successfully rear a large brood. Docility is always a good point in the breeding sow, as then assistance can always be rendered without upsetting the animal, with consequent risk of damage to the litter. Select sows from a good source in your own district if possible, as the animals are acclimatised and used to the feeding conditions prevailing in the area. This is a point well worthy of consideration in the dairying districts as sows imported from the wheat belt and used to heavy grain feeding take some time to accustom themselves to a main diet of skim milk.

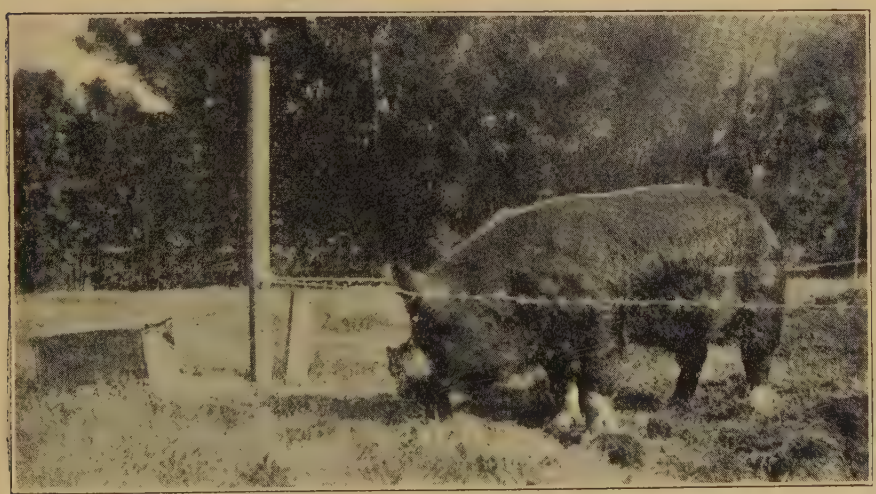
Having selected your breeding animals, the next point is mating. Your boar is a valuable animal, so do not waste him, by allowing him to run with the sows, one service at the beginning of the heat period and one near the end is ample. Record the date of service so that the sow may be moved to suitable quarters for farrowing and the necessary supervision given during confinement.

The boar should have a well grassed run (Kikuyu and clover is excellent), a weather-proof shed and access at all times to fresh pure water as well as his usual ration of grain, milk, mineral supplement and, if required for heavy service, the protein supplement should be increased.

Sows grazing on good mixed pasture need little other feeding until near farrowing time.

Brood sows should have the same conditions as above. Large areas of run will prevent undue rooting on behalf of the animals. A lick, composed of 112 lbs. of sterilised bonemeal, 20 lbs. slaked lime, 10 lbs. of coarse salt, 5 lbs. of powdered copper sulphate and $\frac{3}{4}$ of an ounce of cobalt chloride, made into a solution and well mixed through the other ingredients, is a good general lick fed at about an ounce per head per day.

An electric fence is a handy aid in pig grazing, as "once bitten" pigs respect the wire forever after.



The sow should be removed from the paddock to her farrowing pen at least a week before farrowing, to enable her to familiarise herself and settle down to her new surrounding. She should now receive an allowance of cut greenstuff each day and bran can be added to the concentrate diet as its laxative properties are particularly helpful at this time. Do not feed for at least 24 hours after farrowing

and then only a light feed is necessary, but gradually increase succeeding feeds until the sow is receiving as much as she will consume. The reason for not feeding until some time has elapsed after parturition is because, being fatigued after the meal, she will naturally lie down to the neglect of her litter and possibly lie on a number of the new born. A farrowing rail is a device well proven in its worth, and a new idea stated to further reduce loss of young piglets is to give the floor of the farrowing pen a fall of an inch and a half to the foot, the theory being the farrowing sow likes to have her back up hill and the piglets, being likewise weak on their feet, tend to wobble down hill out of the way. The sow should be provided with plenty of warm litter to make a bed for herself and family. Creep feeding of piglets from three weeks onwards is essential if the pigs are to avoid a setback at weaning time. If skim milk is short, see that the first pigs to receive an adequate ration are your young growing pigs, as they need the extra protein for skeletal development.

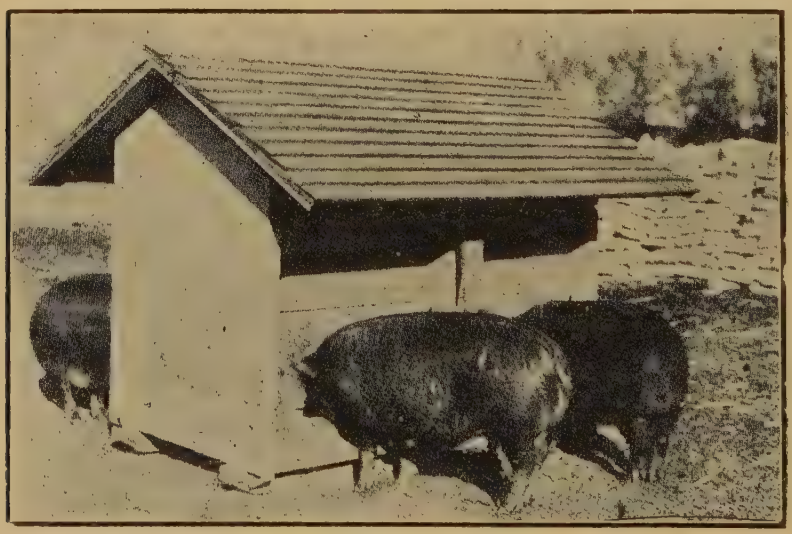
Weed out the runts. Why spend time and money in feeding an animal that is probably not going to clear expenses? Let the little extra feed go to the profit makers.

Pigs at all stages should be kept in sanitary surroundings if loss by disease is to be prevented. Good drainage is essential.

Castrate at two weeks old to give the piglet plenty of time to get over the operation while still being suckled. Pigs should be marked at this time also so that their later progress can be traced.

Wean the piglets at eight weeks by moving the sow from the yard for preference and remate three to four days later.

The young pigs should have, at all times, an adequate ration of greenstuff and protein rich supplement. *Keep them growing.* Once a pig receives a check to growth, it ceases to be a profitable proposition.



The Self-Feeder working.

At 11 to 12 weeks the young pigs can be given an open run with plenty of greenstuff and self-feeders. Here a note of warning must be sounded, as self-feeders can prove very wasteful. Two devices to prevent waste are self-closing lids which

the pigs soon learn to open. This prevents loss from wind, poultry and other animals and prevents souring with attendant digestive troubles. Pigs tend to waste food by a sideways swing of the head so the placing of traverse bars six to eight inches apart for weaners and young pigs and 10 to 12 inches for baconers usually pays good dividends. Having the self-feeder mounted on a concrete platform with a gutter to collect spilt grain is also an advantage. Always crush grain, as this prevents the pigs from eating their own droppings, which unsanitary habit greatly increases the liability to worm infestation with its consequent drastic loss to the pig farmer. Digestibility is also increased. Excessive feeding can be wasteful. Pigs are sometimes carried overweight with an obvious increase in the cost of production without realising any more in the saleyard.

The necessity of breeding from a line of "good doers" has been emphasised before, but it is just as well to reiterate at this stage, as various families vary widely in their ability to convert foodstuffs to pork.

Feeding undamped grain from open windblown troughs is also a wasteful practice.

As labour is an expensive item in pig production, all water and skim milk should be piped to the yards, the water supply float controlled and the milk supply manually controlled.

Heavy losses may occur if incorrect feeding methods are adopted during the breeding period. Exercise and ample green feed should be coupled with a mineral supplement and a good diet. Over-fatness is the one point to be guarded against at this period.

At four to five months the pigs should be again yarded and fed greenstuff twice a week. Overfeeding of greenstuff at this stage is liable to discolour the fat. The protein portion of the ration can also be decreased with a corresponding increase in the carbohydrates. At five to six months the pig should be ready for the market and little more remains to be said except that pigs free from vermin and filth present a better appearance in the saleyard and consequently realise a few shillings higher price. Never over-heat the pig on sale day, nor in loading or handling use methods that are liable to bruise the carcase or otherwise deteriorate its appearance. If the day is hot, cut some boughs to shade the waggon or truck used to cart the pigs to sale. Allow access to water but do not feed.

SOIL CONSERVATION AND FARMING PRACTICE.

By G. H. BURVILL, Commissioner of Soil Conservation.

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At the present time millions of the world's peoples are short of food, clothing and shelter, even in some countries where prior to 1939 supplies were more or less adequate. The war caused big changes in production and distribution which will take time to rectify, and Australians are fortunate to live in a country which produces food in excess of its people's needs.

But even though Australians have adequate food and clothing, and can produce a surplus to export, it is an opportune time to remind ourselves of the important, in fact, indispensable, part played by the soil in the production of our food, our

Water erosion in the wheat belt. Erosion by gullying is the most obvious, though perhaps not the most destructive form of water erosion. Uncontrolled gullies make paddocks awkward to work.

Air Photo: by Kingsley Watson.

clothing, our warmth and our shelter. It requires only a few moments of thought to appreciate how much of our daily living and comfort has been derived from plants grown on the soil, or from animals which have depended on plants, and hence the soil, for food.

The soil is, therefore, a basic factor in mankind's existence on the earth, and soil conservation is vital to everyone, be he farmer or city dweller. To the farmer it has most direct concern, for the soil is the basic asset of his farm and his livelihood. If he can preserve and improve his soils then the national aspect is secure.

What should a farmer do to conserve and improve his soils, and especially to prevent their erosion and removal by water and wind ?

Graded banks and working on the contour help control water erosion. Filled in gully (centre) can now be worked across.

Photo: Government Printer.

Firstly, he should try to understand as much as possible of the soil make up, and the way it functions in supplying essentials for plant growth. Secondly, he should strive to adapt his farming practices so as to assist and improve the soil to carry out those functions. In other words "use every acre according to its capabilities ; treat every acre according to its needs."

Soil is the natural medium from which plants get mechanical support and from which, through their roots, they absorb water and many essential elements for successful growth. The soil is the thin outer layer of the earth's crust, and is usually only a few feet thick. It is produced in nature by the action of the weather, and of plants and animals, on the rocks of the earth's crust. The rocks and rock minerals are broken up and decomposed, and some new minerals with sticky clay properties formed. The dead remains of plants and animals which have lived on and in the soil partly decompose and provide humus. This humus darkens the surface layers and has important functions in supplying nitrogen, and holding moisture and plant nutrients such as phosphate and potash. Teeming millions of bacteria, fungi, and other

microscopic living organisms work ceaselessly in the upper layers of the soil, making over dead plant and animal remains into simpler products. These can be taken up again by plants or help to keep the soil in good condition for water absorption and aeration—the condition the farmer calls "good tilth". The soil is not just a mass of broken-up rock but a dynamic, ever changing, complex of mineral matter, organic matter—both dead and living—moisture and air.

By processes of natural erosion soil is transferred from place to place by running water and wind. Nature's protective mantle of vegetation generally allows this to occur no faster than new soil can be produced. But to meet man's need, it has been necessary to remove the natural vegetation to grow crops or pastures and farming practices must be adapted to fit in with nature, and so prevent accelerated removal of the very valuable topsoil. When topsoil is shifted away by water and wind faster than under natural conditions, then soil erosion—*man made* soil erosion—is in progress.

Where soil erosion has already occurred or is actively in progress, special control measures, as well as altered farming practices are frequently necessary. Where no erosion, or only slight erosion is apparent, farmers still have an obligation to themselves and to the nation to make conservation farming their deliberate goal.

The natural contribution which living and dead plants make to the protection and fertility of the surface soil is a basic principle in conservation farming. This means that, if possible, the soil should not be left bare, and that crop remains should be left for surface protection and ultimate breakdown to humus, unless there is some special reason for their destruction.

Subterranean clover—a valuable ally in soil conservation and soil improvement on lighter soils in areas with over 14 inches annual rainfall.
Photo: Government Printer.

Under Western Australian conditions there are few farms, except those devoted to special crops such as fruit, vegetables and tobacco, which do not carry stock. Therefore, the establishment and improvement of pastures can have direct benefit as well as contributing to soil conservation. On all soils, and in all types of mixed farming, periods of pasture are desirable. This is especially true where slopes are steep or where the soils are sandy and liable to wind erosion. Plants of the legume family such as clovers and trefoils are of special value for grazing and soil improvement purposes. As a specific example, subterranean clover seems destined to be a great ally in soil conservation efforts. It is best adapted to sandy and gravelly and other light soils, and these are the very soils most subject to water and wind erosion. Enterprising farmers are extending subterranean clover into lower rainfall areas on suitable soils, and where the annual rainfall is over fourteen inches there is ample evidence of success. The management of pastures is important. Overgrazing and lack of superphosphate topdressing may greatly offset their value in soil conservation.

The advice that soils should not, if possible be left bare, immediately brings to mind the practice of fallowing. Fallowing involves leaving the soil more or less bare for several months prior to the planting of a crop, and in most cases has resulted in better crops. Many soils of medium and heavy texture on flat or gently sloping areas can be safely fallowed without fear of serious erosion. But even in such

Wind erosion, Newdegate district. Exposed stumps and roots indicate amount of wind erosion.

Photo: G. H. Burvill.

cases, excessive working of the soil, especially when dry, should be avoided. A rough surface, with some grass or straw trash, reduces wind velocity at ground level, and so too, the likelihood of wind erosion. Excessive working with implements can also reduce the capacity of the soil to absorb water rapidly, and it is quite obvious that ability to absorb water is a first line of defence against water erosion. Fallowing of sandy soils should aim to leave them rough and ridged, and in some cases grazing crops of oats or rye may be grown, and the fallowing done later in the season after partial grazing. Where the rainfall is sufficient to grow subterranean clover the soils on which it grows will, in most cases, later produce cereal crops without the use of a fallow period.

Cereal rye is a valuable crop for stabilising drifting sands. In the seedling stage it is not cut off by sand blast.
Photo: Government Printer.

Sloping lands in the fifteen to twenty-five inch rainfall areas of Western Australia probably have the most urgent need for conservation farming practices. Besides the help from pastures and reduction in fallowing they need contour farming, and in some cases contour or grade banks, to assist. But it should be specially noted that contour and grade banks, sometimes thought to be the first essential in erosion control, will not be effective unless coupled with other sound farming practices.

GRADE HERD RECORDING.

R. A. Paul (Acting Superintendent of Dairying)
and
G. W. R. Scott (Dairy Instructor).

This is the first annual report of Grade Herd Recording since the season 1941–42, when operations were suspended for the duration of the war.

Negotiations to commence again started early in 1946, with the result that 21 units were formed and the first test carried out in May of that year.

Seasonal conditions were not very favourable during the year under review, as after a good opening in April and May, very heavy rains were recorded in June and again in August resulting in slow pasture growth. September proved favourable but once again a dry October was experienced, with the result that the growing period for pasture was shortened and hay crops were lighter than expected. No useful rain then fell until towards the end of the testing season in March.

TABLE 1.

AVERAGE PRODUCTION PER COW, 1934–47.

Year.	No. of Cows.	Milk.	Test.	Butterfat.
		gals.	%	lbs.
1933–34	4,308	415	4·35	180·60
1937–38	10,033	486	4·59	223·10
1938–39	12,368	487	4·48	218·70
1939–40	11,479	462	4·51	208·30
1940–41	9,609	447	4·45	199·00
1941–42	7,081	496	4·52	224·02
	*5,695	502	4·61	231·78
1946–47	11,944	420	4·36	181·00

* Excludes four units tested for from six to seven months only.

Table I shows the average production per cow for the initial year of testing 1933–34 and each year from 1937–38.

It is interesting to note that in the initial year that 4,038 cows gave an average production of 415 gallons of milk and 180·6 lbs. butterfat, almost identical figures as the year under review when 11,944 cows gave 420 gallons of milk and 181 lbs. of butterfat.

Various reasons may be advanced for the decline in the average production per cow, not least of which would be the rationing of superphosphate during the war years, the lower quality of that fertiliser and shortages of labour, materials and foodstuffs. However it is as well to bear in mind that farmers did not have the advantage of having their cows tested so that any culling, or replacement was not done with the sure knowledge that the best results would be obtained. Obviously considerable ground remains to be recovered due to lack of testing facilities for five years.

TABLE 2.

PRODUCTION PER COW IN EACH UNIT.

(Units listed in order of merit.)

Unit.	No. of Herds.	No. of Cows.	Percentage of Heifers. †	Milk. Av.	Test.	Butterfat Av.
				lbs.	%	lbs.
1. G. Cowaramup, North ...	21	548	38	4,930	4·58	228·00
2. F. Metricup	23	541	39	4,784	4·53	216·70
3. J. Rosa Brook	22	606	30	4,375	4·57	201·90
4. E. Ruabon	19	669	33	4,834	4·17	201·60
5. B. Waroona	16	566	33	4,516	4·40	198·00
6. H. Cowaramup, South ...	17	481	30	4,792	4·06	194·90
7. L. Donnybrook	22	558	36	4,045	4·34	193·00
8. C. Harvey	15	538	15	4,446	4·32	192·00
9. W. Denmark	20	421	33	4,224	4·53	191·67
10. I. Margaret River ...	23	549	37	4,214	4·44	187·40
11. A. Pinjarra	18	596	20	4,338	4·20	184·00
12. M. Balingup	23	742	23	4,233	4·29	181·53
13. D. Brunswick	14	461	*	4,025	4·50	181·00
14. U. Nannup	23	675	20	3,978	4·28	170·00
15. O. Manjimup	22	603	22	3,965	4·23	167·80
16. N. Bridgetown	21	670	26	3,897	4·29	167·50
17. T. Albany	22	505	33	3,831	4·33	166·00
18. K. Forest Grove	25	741	15	3,544	4·61	163·30
19. R. Wilga	21	454	35	3,560	4·60	162·00
20. S. Mt. Barker	23	613	36	3,725	4·25	158·53
21. P. Pemberton	22	407	13	3,777	3·99	148·37

* No. of Heifers not available. † Including two and three year olds.

Table II gives the average production per cow in each unit in order of merit. An analysis of the Table shows that the production in 8 of the 21 units is below the average for the State. Little further comment is called for in regard to this Table, but from the records of previous years it is shown that those units that test year after year usually show the best productions within a comparatively short time. This of course would only apply to those units where there are no frequent changes in the herds under test. It is only from continuous testing that farmers can expect to get the maximum benefit. In this connection the performance of the herd of Mr. O. Foan, Donnybrook is an outstanding example. In the year 1933–34, this herd of 14 cows was 12th in the unit, the following year 9th, and the next year 3rd. The next year, 1936–37, it topped the unit with a production of 319 lbs. butterfat from 21 cows. Each year since then this herd has topped the averages in the Donnybrook unit, the highest average production being 359 lbs. fat in 1937-38. Entering test again during the year under review, Mr. Foan once again topped the averages not only in the Donnybrook unit, but in the State. During the year, his herd of 24 cows averaged 344 lbs. fat.

This is a fine performance and reflects great credit on the owner.

Table 3 sets out the herds grouped according to production. In the comparison with other years, it is clearly shown that improvement is called for. For the year 1946–47, 65·7% of the herds produced less than 200 lbs. per cow, compared with only 43·7% in 1939–40 ; 52·9% in 1940–41 and 26·2% in 1941–42.

Table 3.

HERDS GROUPED ACCORDING TO PRODUCTION.

Butterfat per head (lbs.).

Year.	350–400.	300–350.	250–300.	200–250.	150–200.	100–150.	Under 100.
	%	%	%	%	%	%	%
1933–34	...	1·3	3·9	20·3	53·6	18·3	2·6
1939–40	...	3·2	18·5	34·6	32·9	9·7	1·1
1940–41	...	1·5	13·9	31·8	39·4	12·7	·8
1941–42	1·6	8·2	21·9	42·1	21·5	4·7	...
1946–47	...	1·2	7·9	25·2	39·9	22·4	3·4

Table 4 gives the production of all cows grouped according to production of butterfat, and whether they are mature or heifer class.

Here again is shown the fall in the higher range productions as compared to 1942.

Table 4.

COWS GROUPED ACCORDING TO AGE AND PRODUCTION.

(Cows tested less than 90 days excluded.)

Groups according to Butterfat Production (lbs.).

Age.	Over 600.	500–600.	400–500.	300–400.	200–300.	150–200.	100–150.	Under 100.	Total Cows.	Year.
	%	%	%	%	%	%	%	%		
Mature...	0·02	0·3	2·4	21·8	46·4	17·4	8·7	3·0	4,287	1942
Do. ...	...	0·07	0·68	7·97	35·16	26·37	20·13	9·62	8,711	1947
Heifers...	...	0·05	0·2	5·8	36·9	27·5	20·2	9·4	1,978	1942
Do. ...	...	...	0·1	3·2	25·5	29·4	25·8	16·0	3,232	1947

Portion of Mr. O. Foan's high producing herd. Showing the foundation cow in the foreground.

Grade cow showing type and quality, an acquisition to any herd. Produced 148 lbs. fat in first two testing periods. Owned by O. Foan, Donnybrook.

In Table 5 is given the production of cows according to the month of calving. Data published in past reports from 1936 onwards, showed that there was an optimum period for cows to calve. This is once again borne out for the year 1946–47, and

in Table 5 the results for 1946–47 are given, as well as all the figures for the seven years for which statistics have been taken out. The figures show that cows calving in the months March to July can reasonably be expected to show higher production than if calving in any of the other months.

High class Jersey grade heifers.

Table 5.

PRODUCTION OF COWS ACCORDING TO MONTH OF CALVING.

Month.	Average Butterfat. 1946–47.	Average Butterfat. 7 years 1936–42 and 1946–47.
	lbs.	lbs.
January	170·3	187
February	181·4	201
March	217·1	222
April	217·6	236
May	206·5	236
June	195·8	233
July	184·0	226
August	153·0	199
September	130·3	177
October	114·4	176
November	125·4	184
December	164·0	177

See Graph.

A Graph has been drawn from the figures used in Table 5 and shows very clearly the results obtained.

The total number of lactations recorded since 1936 is 50,089 and of these 77% fall in the months March to July. For the season under review, 9,065 lactations were recorded and 79% fall within the optimum period. It will be noticed that the production figure drops fairly rapidly after July and does not begin to rise again until March.

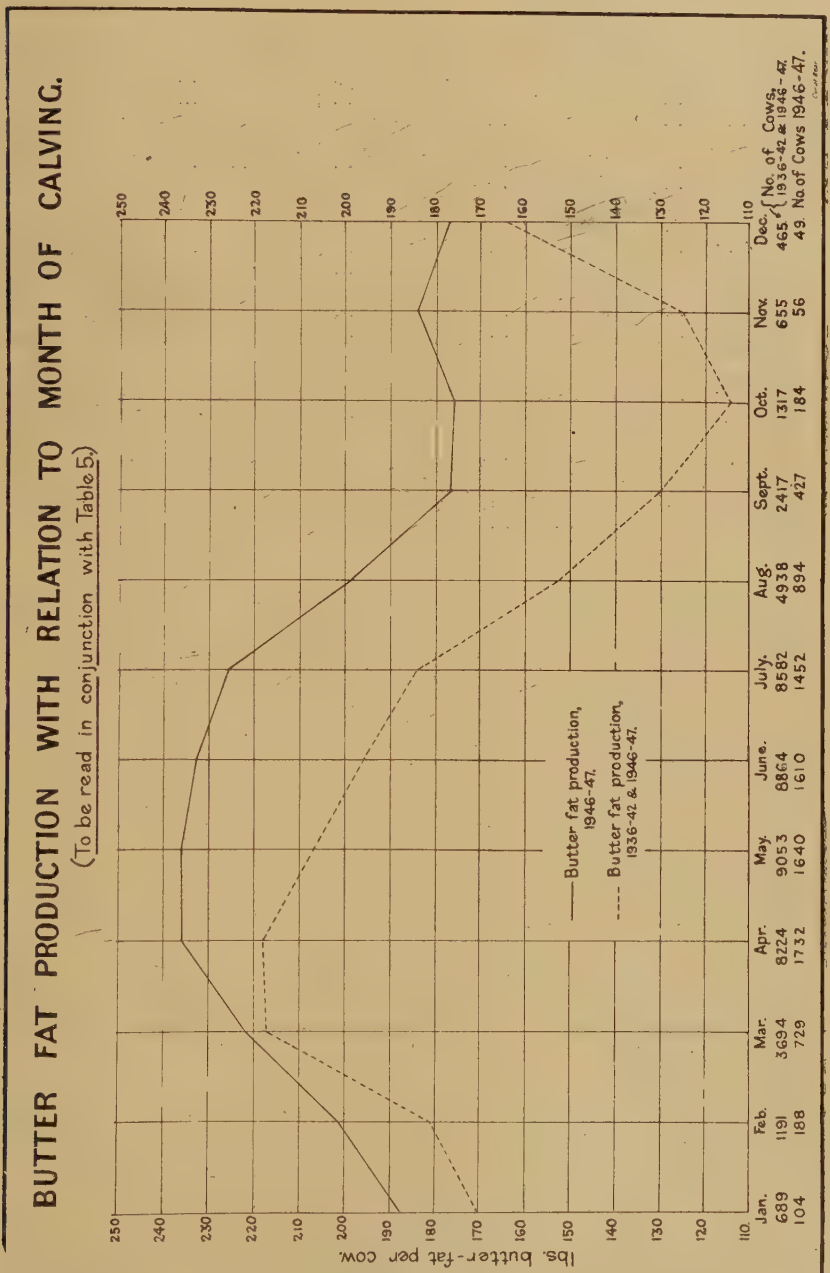

Table 6 shows the highest producing cow in each unit. These figures speak for themselves and are really meritorious.

Table 6.

THE HIGHEST PRODUCING COW IN EACH UNIT.

Owner.	Unit.	Cow.	Breed.	Test.	Butterfat.
				%	lbs.
F. Doak	Rosa Brook ...	Maisie I. ...	A.I.S. ...	4·20	558·00
A. Millar	Forest Grove	Betty ...	Jersey ...	5·33	531·00
L. M. Temple ...	Harvey ...	Brownie ...	Jersey ...	5·90	520·00
J. Lefroy	Cowaramup, N.	Rose ...	Guernsey ...	5·41	507·00
D. Della	Pemberton ...	Sydney ...	Shorthorn x Guernsey	4·36	504·57
V. R. Bunbury ...	Metricup ...	Sadie ...	Friesian ...	4·10	493·00
D G. Spark ...	Pinjarra ...	Freckles ...	Jersey ...	5·90	488·00
R. C. Eastcott ...	Waroona ...	Posie ...	A.I.S. ...	4·10	483·00
M. L. House ...	Ruabon ...	Daphne ...	A.I.S. ...	4·79	481·99
O. Foan	Donnybrook ...	Brownie ...	Jersey ...	5·30	480·00
A. Millar	Cowaramup, S.	Gwen ...	Jersey ...	5·67	467·00
R. A. Clarke ...	Brunswick ...	Curley ...	Jersey ...	6·70	455·00†
F. R. H. Pugh ...	Mt. Barker ...	Janet ...	Jersey ...	4·70	447·00
F. Gianoni	Nannup ...	Phyllis ...	Jersey ...	5·11	441·00
J. A. Dowrick ...	Balingup ...	Brownie ...	Jersey x A.I.S.	5·30	440·00
F. Allwood	Albany ...	Dock ...	Guernsey x	5·28	439·00
G. E. Johnston ...	Margaret River	Twink ...	Jersey x Guernsey	5·13	416·00
W. Middleton ...	Denmark ...	Stumpy ...	Jersey ...	4·92	408·19
M. Kilrain	Manjimup ...	Loris ...	Shorthorn x Guernsey	4·60	406·00
J. C. Williams ...	Bridgetown ...	Ethel ...	Jersey ...	5·70	388·00*
H. Ford	Wilga	Jennie ...	Jersey x Shorthorn	4·80	352·00*

* Eight tests only † Seven tests only, to December.

In Table 7 is given the names of the winners of the Co-operative Dairy Farmers Trophy in each Unit, together with the average butterfat production for the herd.

Table 7.

THE CO-OPERATIVE DAIRY FARMERS TROPHY.

Trophy for Highest Producing Herd in each Unit, 1946–47.

Owner.	Unit.	Butterfat Average.
		lbs.
O. Foan	Donnybrook	344·00
D. Della	Pemberton	333·87
V. R. Bunbury	Metricup	313·00
M. Brennan	Balingup	299·40
M. L. House	Ruabon	295·03
G. S. Blakie	Cowaramup, South	295·00
L. A. House	Pinjarra	293·00
L. M. Temple	Harvey	286·00
T. H. M. Lefroy	Cowaramup, North	282·00
W. Middleton	Denmark	274·33
F. R. H. Pugh	Mt. Barker	272·50
F. Gianoni	Nannup	272·00
R. J. Henderson	Rosa Brook	269·00
W. R. Foster	Waroona	265·00
A. Miller	Forest Grove	259·00
H. G. Letchford	Bridgetown	253·57
A. R. Lang	Margaret River	250·14
Farr Bros.	Albany	250·00
V. A. Robinson	Brunswick	233·00
R. Wright	Wilga	228·00
A. J. S. Angel	Manjimup	226·60

These trophies have been made available through the generosity of the South-West Co-op. Dairy Farmers, Ltd., and the Great Southern Co-op. Butter Co. Ltd., with the object of stimulating interest in Grade Herd Recording and to encourage higher production herds.

For the year under review, the trophy in each unit has been awarded to the highest producing herd, but in subsequent years will be awarded to the herd showing the highest points as per an improvement schedule drawn up by the two companies mentioned and the Superintendent of Dairying.

A second trophy will be awarded after the completion of the second year's testing to the herd gaining the highest number of points in the State ; whilst a major trophy is being awarded to the herd showing the highest number of points at the end of each three years testing for the whole of the State.

TABLE 8.

COWS COMPLETING LACTATION.

Unit.	Percentage of Cows completing Lactation.*	Butterfat Average.	Percentage of Cows completing full 273 days.	Butterfat Average.	Unit Butterfat Average.
		lbs.		lbs.	lbs.
F. Metricup ...	48	260·70	29	298·05	216·70
J. Rosa Brook ...	86	213·10	32	288·13	201·90
H. Cowaramup, South	89	211·00	36	265·84	194·90
L. Donnybrook ...	90	190·50	23	265·01	193·00
C. Harvey	71	197·00	20	257·59	192·60
A. Pinjarra	79	195·00	21	256·63	184·00
D. Brunswick ...	36	202·20	10	253·22	181·00
B. Waroona	72	207·20	36	251·37	198·00
G. Cowaramup, North	82	236·30	47	250·97	228·00
S. Mt. Barker ...	52	174·14	11	250·43	158·50
K. Forest Grove ...	77	184·00	20	250·01	163·30
T. Albany	84	161·50	21	247·83	166·00
I. Margaret River ...	51	202·00	25	241·75	187·40
P. Pemberton ...	88	159·40	20	240·84	148·37
E. Ruabon	73	211·60	28	240·43	201·60
M. Balingup	77	182·00	25	238·13	181·53
N. Bridgetown ...	92	169·10	14	235·59	167·50
W. Denmark	57	206·30	44	228·13	191·67
O. Manjimup ...	83	171·30	20	221·52	167·80
U. Nannup	97	171·60	24	220·74	170·00
R. Wilga	83	162·00	7	216·00	162·00
Averages	74	184	24	250	181

Average butterfat of cows not completing full 273 days :—157·46 lbs.

* *i.e.*, 273 days or drying off naturally in a lesser period.

Table 8 gives a comparison between the average production of those cows which completed a full 273 days testing, those which completed lactation and those which were tested 90 days and over. The Table shows that 24% of the cows completed a full 273 days for an average production of 250 lbs. of butterfat. This figure is considerably in excess of the 184 lbs. recorded by those cows completing lactation, or the 181 lbs. shown for those testing 90 days and over. Records show that by far the greatest number of cows under review, calve before the end of July, so that it is obvious that there are a large number of cows which could be termed "short-time" cows. That is cows which will not milk or are not given the opportunity to milk for a full 273 days.

Fodder conservation in the South-West.

This is one obvious method of increasing production per cow, as it is only to be expected that a cow milking a full 9 months will produce more than if she milked for seven or eight months only and is then turned out of the herd.

For the first time under the Grade Herd Recording Scheme, particulars were collected regarding the cause of wastage in the various herds. This information is given for each Unit and for the State, in Table 9, hereunder, under the various headings.

TABLE 9.

GRADE HERD RECORDING—HERD—WASTAGE RETURN.

No.	Unit.	No. of Cows in herd.	Total Disposals, Wastage, etc.	Sold for Dairying Purposes.	A	B	C	D	E	F	G	H	I
						Disease.				Other Causes.			
					Low Production.	Udder Troubles Mammitis, etc	Abortion and Sterility.	T.B.	Other Diseases.	Accident or Injury.	Old Age.	Other Causes.	Sundry Deaths.
A	Pinjarra	497	61	1	35	6	...	...	...	2	2	13	2
B	Waroona	491	45	2	20	2	4	3	...	1	3	9	1
C	Harvey	357	19	...	7	5	4	...	...	1	...	2	...
D	Brunswick	262	24	...	13	5	2	...	...	...	...	1	3
E	Ruabon	390	29	5	20	1	1	...	...	...	...	2	...
F	Metricup	365	53	7	43	2	...	...	...	...	1	...	...
G	North Cowaramup	425	71	24	40	3	...	...	...	4	...	...	...
H	South Cowaramup	245	41	27	8	...	...	1	1	2	2	...	...
I	Margaret River	445	81	15	30	20	4	...	1	2	7	...	2
J	Rosa Brook	450	46	6	24	9	3	...	...	...	2	...	2
K	Forestgrove	249	29	7	19	1	...	...	...	2	...	...	...
L.	Donnybrook	150	15	...	8	2	2	...	...	1	...	2	...
M.	Balingup	27	6	6	...	...	...	...	...	...	...	...	...
N.	Bridgetown	571	58	1	21	8	...	...	7	4	8	9	...
O.	Manjimup	441	51	4	22	12	1	...	2	...	4	1	5
P.	Pemberton	127	19	11	8	...	...	...	...	...	...	...	...
R.	Wilga	482	104	3	87	9	...	...	...	1	1	...	3
S.	Mt. Barker	555	77	3	36	8	1	...	...	2	3	17	7
T.	Albany	433	67	3	43	12	...	...	...	4	2	2	1
U.	Nannup	293	28	1	17	1	...	...	...	...	4	4	1
W.	Denmark	311	55	13	35	1	2	...	...	...	1	1	2
	Totals	7,566	979	139	536	107	24	4	11	26	40	63	29
	Percentages	...	12·98	1·84	7·08	1·41	0·32	·05	·15	·34	·51	·83	·39

It will be seen from the Table that the total wastage reported was 12·98%, and of this by far the greatest proportion was made up of animals that were quitted on account of low production. Apart from wastage due to udder troubles, losses under the other headings are very small and of little significance.

Unfortunately, information was not obtained from all testing members, and on that account the figures are not entirely satisfactory but do serve as a very good guide as to the likely causes of wastage. The overall figure of 12·98% is low when compared to New Zealand figures and those collected some years ago by this Department during the Better Dairying Competition. Both sources indicated that the yearly wastage figure ranged between 15% and 17%. It is intended to collect the above information each year throughout all units, so that within a very short period information of a reliable character will be available under all headings.

The herd at pasture. A familiar scene in the dairy areas.

The following Tables 10 to 13, show the leading herds in the groups of under 20 cows; 20–30 cows; 31 to 50 cows and over 50 cows. Previously these Tables have proved of interest to all members.

Table 10.
LEADING HERDS OF LESS THAN 20 COWS.

Name of Owner.	Unit.	No. of Cows.	Breed.	Butter Fat Average.
				lbs.
D. H. Bell	Metricup	13	A.I.S.	312·54
G. Barnsby	Pemberton ...	14	Guernsey	300·35
L. A. House	Pinjarra	18	Jersey	293·00
L. M. Temple	Harvey	17	Jersey	286·00
G. M. Cabassi	Pemberton ...	14	Guernsey	276·06
R. J. Henderson ...	Rosa Brook ...	15	Guernsey	269·00
H. Lewis	Metricup	16	Jersey x Shorthorn	268·00
H. Hawkesford	Cowaramup, North	11	Jersey x Shorthorn	262·00
F. Doak	Rosa Brook ...	18	Mixed	260·00
G. Sneddon	Rosa Brook ...	15	Shorthorn	250·00

TABLE 11.

LEADING HERDS OF 20–30 COWS.

Name of Owner.	Unit.	No. of Cows.	Breed.	Butter Fat Average.
				lbs.
O. Foan	Donnybrook ...	24	Jersey	344·00
D. Della	Pemberton ...	21	Mixed	333·87
M. Brennan	Balingup	27	Jersey x Guernsey	299·40
M. L. House	Ruabon	20	Shorthorn	295·03
G. S. Blakie	Cowaramup, South	30	Shorthorn	295·00
D. G. Spark	Pinjarra	29	Jersey	288·00
N. L. Murdock	Metricup	21	Jersey	288·00
T. H. M. Lefroy ...	Cowaramup, North	25	Shorthorn x Jersey	282·00
J. Lefroy	Cowaramup, North	29	Jersey and Guernsey	281·00
W. Middleton	Denmark	23	Jersey	274·33
A. Millar	Cowaramup, South	29	Jersey	265·00
R. W. Gregson	Forest Grove ...	24	Guernsey	259·00
S. Pedretti	Nannup	21	Jersey x Shorthorn	259·00
J. A. Dowrick	Balingup	27	Jersey x Guernsey	258·00
A. R. Lang	Margaret River ...	29	Mixed	251·40
Farr Bros.	Albany	30	Guernsey	250·00

TABLE 12.

LEADING HERDS OF 31–50 COWS.

Name of Owner.	Unit.	No. of Cows.	Breed.	Butter Fat Average.
				lbs.
G. Layman	Donnybrook ...	44	Jersey	292·00
S. C. Maidment	Balingup	41	Jersey x Shorthorn	278·30
W. B. and R. L. Blakie ...	Cowaramup, North	40	Jersey	277·00
F. R. H. Pugh	Mt. Barker ...	47	Jersey x	272·50
F. Gianoni	Nannup	39	Jersey and Jersey x Shorthorn	272·00
W. R. Foster	Waroona	32	Jersey and Shorthorn x	265·00
A. G. Thompson ...	Ruabon	43	Jersey	260·30
D. O. Briggs	Metricup	31	Friesian x	258·26
E. L. Brockman ...	Ruabon	39	A.I.S.	256·51
H. G. Letchford ...	Bridgetown ...	35	Jersey	253·50

TABLE 13.

LEADING HERDS OF 51 OR MORE COWS.

Name of Owner.	Unit.	No. of Cows.	Breed.	Butter Fat Average.
				lbs.
V. R. Bunbury	Metricup	67	Fresian and Shorthorn	313·00
A. Millar	Forest Grove ...	51	Jersey and Guernsey	259·00
J. Torrent	Ruabon	54	Shorthorn and Jersey	234·93
E. B. and H. M. McNeill ...	Waroona	67	Shorthorn x ...	228·00
R. A. and J. A. Jackson ...	Rosa Brook ...	56	Shorthorn x ...	219·94
T. Hick	Cowaramup, North	61	Mixed	219·00
R. Beacham	Pinjarra	57	Shorthorn x Jersey	211·00
L. J. Hooker	Harvey	52	Shorthorn	209·00
H. J. Mullins	Pinjarra	56	A.I.S.	207·00
J. Salerian	Waroona	74	Jersey x and Red Pole	200·00

In previous reports, a list of "Proved Bulls" has been published and this information has once more been carefully compiled.

TABLE 14.

BULLS WITH 6 OR MORE DAUGHTERS COMPLETING LACTATION—NO ALLOWANCE FOR AGE.

Name of Bull.	Breed.	No. of Daughters.	Average Butterfat Production.	Unit.	Owner.	Age Bull.
			lbs.			
Prince Peep	Jersey	6	378·50	Donnybrook	O. Foan	13
Greenmount Bright Lad	do.	6	369·50	Pinjarra	D. G. Spark	10
Hopelands Pattern	do.	6	340·50	Donnybrook	G. Layman	7
Sophie's Monarch (Grade)	do.	6	334·00	Donnybrook	O. Foan	7
Navua Coronation Star	do.	8	328·50	Harvey	L. M. Temple	10
Greenmount Golden Victory 2nd	do.	6	306·50	Pinjarra	L. A. House	11
Navua Royal Star	do.	6	304·66	Harvey	Mrs. A. G. Eckersley	10
Hopelands Bidomak	do.	6	295·00	Donnybrook	G. Layman	8
Frisky Lad (Grade)	do.	12	293·70	Bridgetown	H. G. Letchford	Dead
Moorelands Julian	do.	9	293·55	Pemberton	J. J. Littlefair	13
Camden Pluto	do.	10	291·60	Cowaramup, South	G. V. Crooke	10
Crantock Napoleon's Masterpiece	do.	10	289·90	Denmark	W. Middleton	9
Radyr Park's Spotted Boy	do.	10	278·30	Cowaramup, South	A. Millar	12
Fairfield's Golden Chief	do.	13	271·30	Bridgetown	H. G. Letchford	11
Grantham's Oxford Altitude	do.	6	253·83	Donnybrook	A. C. Frost	10
Radyr Park Golden Lad	do.	8	249·00	Bridgetown	V. Dezotti	Dead
Brookvale Orphan	do.	11	244·10	Bridgetown	J. C. Williams	Dead
Ferdinand (Grade)	do.	6	241·50	Donnybrook	A. Clifford & Sons	5
Walgetts Masterpiece Beau	do.	18	241·10	Bridgetown	J. C. Williams	Dead
Grantham's Easter Monarch	do.	6	238·33	Donnybrook	G. V. Mitchell	13
Colmyn Golden III	do.	10	238·10	Metricup	A. S. Mutimer	9
Walgett Handsome Beau	do.	6	235·00	Donnybrook	W. F. Dilley	12
Maxon Noble	do.	6	228·83	Margaret River	W. J. Rowe	...
The Towers Empire Prince	do.	6	225·00	Donnybrook	R. Benson	11
Moorlands Gold Duke	do.	6	220·00	Cowaramup, South	A. Millar	7
Grassvale Prince Charlie	do.	8	207·87	Marybrook	A. J. Bell	Dead
Walgetts Guardian	do.	8	203·88	Nannup	J. T. McKittrick	8
Colmyn White Sox	do.	6	203·00	Donnybrook	G. L. Henfry	14
Cestrefeld Bonnie Charlie	do.	12	199·00	Manjimup	W. J. Morgan	9
Kapara Emblem	do.	17	194·59	Denmark	J. Stephens	9
Popeye (Grade)	do.	6	189·33	Donnybrook	P. Proctor	9

TABLE 14—*continued.*

BULLS WITH 6 OR MORE DAUGHTERS COMPLETING LACTATION—NO ALLOWANCE FOR AGE.

Name of Bull.	Breed.	No. of Daughters.	Average Butterfat Production.	Unit.	Owner.	Age Bull.
			lbs.			
The Wold's Easter Prince	Jersey	12	187·50	Donnybrook	W. J. Sears	11
Pluto	do.	8	185·70	Cowaramup, South ...	F. Campbell	Dead
Marbelup Gay Lad	do.	7	184·29	Margaret River	W. J. Rowe	9
The Tower's Bunty	do.	6	177·33	Donnybrook	E. J. Kemp	7
The Wold's Starbright Prince	do.	6	171·15	Donnybrook	N. G. Baker	11
Springview Pretty Boy	do.	9	164·44	Balingup	S. G. Guest	8
Grade Bull	do.	6	162·33	Donnybrook	J. T. Mance	6
Grangelea Admiral II	do.	15	162·13	Ruabon	G. F. Staley	15
Camden Hiawatha	do.	6	140·83	Donnybrook	G. Creyk	5
Grafton Melrose (Grade)	do.	10	137·40	Bridgetown	P. W. Letchford	Dead
Brookvale Digger	do.	12	130·00	Bridgetown	G. Roberts	Dead
Leyland's Foch	A.I.S.	6	332·17	Pinjarra	H. J. Mullins	13
Summerlea Cassidy	do.	11	297·64	Ruabon	J. Torrent	...
Newstead Royal Sun	do.	6	288·83	Metricup	D. H. Bell	7
Tregonny Laddie	do.	10	269·70	Nannup	F. Gianoni	10
Ilginup Humber	do.	8	256·88	Ruabon	L. M. Weatherlea ...	Dead
Summerlea Robin Hood	do.	6	248·17	Donnybrook	G. Layman	9
Brackenhurst Marquis	do.	10	244·40	Cowaramup, South ...	A. W. and W. L. Langley	11
Westby Commander	do.	15	238·26	Denmark	F. C. Smith	9
Telyarup Duke	do.	11	236·82	Denmark	L. L. Hargrave	12
Brackenhurst Reward	do.	11	233·45	Margaret River	W. H. George	11
Plenarbor Barney	do.	6	233·33	Pinjarra	H. J. Mullins	6
Glanavon Pilot	do.	16	233·31	Ruabon	E. L. Brockman	7
Summerlea Alphonse	do.	9	231·66	Cowaramup, North ...	E. Clayton	Dead
Fairbridge Prince	do.	6	221·50	Donnybrook	M. C. Fry & Sons ...	14
Tipperary Victor	do.	9	213·00	Waroona	H. D. Hardy	Dead
Summerlea Nought 1	do.	17	203·47	Cowaramup, North ...	Tansell & Lewis	Dead
Wooroloo Rose III Guardian	do.	20	196·70	Manjimup	W. Hamilton	11
Brackenhurst Sailor	do.	15	196·70	Bridgetown	E. A. Roberts	11
Glanavon Neon	do.	9	191·60	Bridgetown	E. A. Roberts	6
Ilginup Surprise Lindsay	do.	8	187·13	Metricup	W. L. Still	6

TABLE 14—*continued.*

BULLS WITH 6 OR MORE DAUGHTERS COMPLETING LACTATION—NO ALLOWANCE FOR AGE.

Name of Bull.	Breed.	No. of Daughters.	Average Butterfat Production.	Unit.	Owner.	Age Bull.
			lbs.			
Brackenhurst Advocate	A.I.S.	13	180·50	Bridgetown	W. K. Walter	12
Haddon Emblem	do.	8	162·70	Bridgetown	H. E. Gifford	8
Brackenhurst Reward II	do.	6	161·50	Bridgetown	W. K. Walter	10
Narracoorte Pal	do.	6	161·10	Bridgetown	L. Fellowes	6
Brackenhurst Roger	do.	8	143·70	Bridgetown	W. K. Walter	6
Summerlea Songster	do.	6	139·83	Donnybrook	M. C. Fry & Sons	8
Glanavon Victory	do.	6	138·00	Manjimup	E. W. Morey	10
Summerlea Empresses Reward	do.	8	101·70	Manjimup	C. H. J. Hastie	7
Riverside Damon	Guernsey	9	309·11	Albany	F. Allwood	12
Rutherwood Daffodil's Prosper	do.	6	305·00	Albany	Goldsmith & Stevens	11
Denmark Dawn's Goldseeker	do.	6	297·00	Albany	Farr Bros.	10
Muresk Justice	do.	8	266·38	Rosa Brook	H. Harrison	Dead
Denmark Bonnie's Ace	do.	8	266·00	Denmark	R. B. Fowler	8
Koojan Ace's Success	do.	11	255·91	Waroona	E. Marston	14
Denmark Anthony	do.	6	245·17	Albany	F. Allwood	12
Drakesbrook Benefactor	do.	11	236·82	Waroona	A. R. Tester	13
Rosella's President	do.	8	234·63	Rosa Brook	J. M. Schipp	8
Lansdowne Aristocrat	do.	6	233·17	Pinjarra	H. Wegner	10
Rosella Majesty	do.	6	229·66	Margaret River	P. E. Jones	9
Denmark Dame's Boy	do.	8	211·63	Denmark	W. G. Corbin	17
Muresk Commander	do.	6	202·83	Margaret River	G. Zani	12
Redhouse Birdie's Freedom	do.	12	197·20	Cowaramup, South	A. L. Galliers	10
Braesides Robin	do.	7	193·14	Pemberton	B. A. Rice	13
Lansdowne Dido	do.	12	177·00	Donnybrook	E. J. Kemp and H. M. Bradshaw	11
Drakesbrook Kingfisher	do.	6	168·50	Waroona	A. R. Tester	12
Braeside Governor II.	do.	9	165·50	Bridgetown	L. Fellowes	8
Lansdowne Golden Dividend	do.	6	162·67	Pinjarra	H. Wegner	5
Sir James (Grade)	do.	23	142·30	Denmark	W. J. Sutton	12
Denmark Damascus	do.	8	120·00	Manjimup	F. S. Little	Dead
Hamel Boy	Red Poll	7	304·71	Cowaramup, North	W. B. & R. L. Blakie	Dead
Hilton Bob	do.	7	140·30	Bridgetown	L. Machin	14
King Griselda	Freisian	14	259·90	Cowaramup, South	L. F. Arthur	Dead

The table gives the name of each bull which has had six or more daughters tested and completing lactation, the average production of the daughters, without allowance for age, the name of the owner of the bull and the approximate age of the animal where still alive.

AVERAGE PRODUCTION OF HERDS IN ALL UNITS.

Particulars of the Production of each herd in each unit under test for the year 1946–47, are listed hereunder.

Balingup "M."	No. of Cows.	Milk Av.	Butter-fat Av.
		gals.	lbs.
M. Brennan	27	656	299·4
S. C. Maidment ...	41	663	278·3
J. A. Dowrick ...	27	567	258·7
Herd I	21	486	222·3
,, N	37	415	216·9
,, A	27	457	210·3
,, U	31	459	201·0
,, T	48	510	191·7
,, O	32	429	177·3
,, V	60	454	173·8
,, C	29	404	173·8
,, H	20	354	171·6
,, S	54	518	169·9
,, D	31	335	161·6
,, R	41	316	157·9
,, K	30	351	157·5
,, Y	47	310	149·6
,, B	15	304	144·4
,, Z	34	293	139·1
,, X	20	317	129·9
,, P	40	325	124·2
,, F	21	247	103·0
,, G	9	209	95·4

Brunswick "D."	No. of Cows.	Milk Av.	Butter-fat Av.
		gals.	lbs.
V. A. Robinson ...	30	490	233
R. C. Gardiner ...	24	512	224
D. B. Rose	45	439	223
Herd I	39	422	219
,, N	36	502	213
,, J	30	328	203
,, C	13	408	186
,, G	60	383	184
,, P	27	406	168
,, H	34	357	144
,, A	48	332	142
,, O	20	350	137
,, M	22	255	106
,, K	33	288	106

Wilga "R."	No. of Cows.	Milk Av.	Butter-fat Av.
		gals.	lbs.
R. Wright	14	551	228
J. Charteris	21	473	218
H. Ford	21	431	203
Herd D	25	417	199
,, G	49	382	185
,, K	35	351	174
,, V	13	402	174
,, N	5	397	174
,, E	8	353	168
,, H	6	316	166
,, P	19	380	164
,, U	23	333	159
,, J	20	318	153
,, B	24	342	154
,, M	32	361	150
,, S	21	311	150
,, Q	42	388	143
,, W	6	303	125
,, L	36	276	119
,, C	25	237	102
,, X	10	236	90

Mt. Barker "S."	No. of Cows.	Milk Av.	Butter-fat Av.
		gals.	lbs.
F. R. H. Pugh ...	47	654	272·50
Cluett & Sons ...	20	506	229·10
Pardelup Prison Farm	24	581	215·41
Herd E	27	436	194·00
,, F	19	455	193·40
,, W	20	439	190·90
,, P	21	421	185·60
,, A	21	364	168·50
,, B	39	380	161·70
,, N	13	392	159·80
,, K	53	392	155·62
,, M	30	345	152·40
,, V	17	345	146·29
,, Q	32	351	144·09
,, I	16	330	143·12
,, G	37	238	137·90
,, O	34	314	136·55
,, C	14	325	131·30
,, R	15	301	126·30
,, T	26	243	103·88
,, S	17	240	96·40
,, L	27	208	91·80
,, J	44	224	80·84

Average Production of all Units—continued.

Pemberton "P."	No. of Cows.	Milk Av.	Butter-fat Av.
		gals.	lbs.
D. Della	21	718	333·87
G. Barnsby	14	522	300·35
G. M. Cabassi ...	14	684	276·06
Herd A	23	495	230·42
„ M	24	425	190·23
„ D	19	415	187·96
„ K	9	439	183·40
„ P	20	386	181·33
„ O	15	358	172·38
„ G	20	353	171·75
„ J	11	341	160·76
„ F	22	350	157·30
„ T	26	356	153·65
„ C	17	286	153·12
„ L	17	337	143·64
„ S	29	300	140·87
„ Q	20	297	138·75
„ I	16	347	138·23
„ R	16	282	136·19
„ U	16	292	127·04
„ N	13	225	93·33
„ V	25	115	90·93

Harvey "C."	No. of Cows.	Milk Av.	Butter-fat Av.
		gals.	lbs.
L. M. Temple ...	17	543	286
Mrs. A. G. Eckersley ...	30	466	238
W. K. Barnes ...	47	546	219
Herd Q	16	479	214
„ B	38	549	211
„ G	52	495	209
„ H	50	463	204
„ M	58	530	198
„ C	35	394	181
„ L	36	419	175
„ D	38	422	175
„ P	32	338	162
„ N	30	307	154
„ I	34	321	146
„ J	25	248	117

Margaret River "I."	No. of Cows.	Milk Av.	Butter-fat Av.
		gals.	lbs.
A. R. Lang	29	546	250·14
P. E. Jones	16	513	243·06
G. E. Johnston ...	16	455	226·30
Herd L	16	502	226·10
„ A	39	541	219·10
„ O	18	443	215·90
„ B	19	411	201·70
„ R	20	425	196·60
„ W	16	423	196·30
„ P	45	428	194·20
„ C	30	459	194·06
„ S	21	457	190·00
„ E	23	426	189·60
„ X	31	398	188·30
„ I	34	410	185·90
„ Q	22	384	167·60
„ K	24	379	162·60
„ H	26	405	161·90
„ J	14	325	143·00
„ M	20	292	139·60
„ D	47	312	137·70
„ Z	23	341	130·00

Ruabon "E."	No. of Cows.	Milk Av.	Butter-fat Av.
		gals.	lbs.
M. L. House ...	20	772	295·03
A. G. Thompson ...	43	578	260·30
E. L. Brockman ...	39	686	256·51
Herd D	54	555	234·93
„ Q	23	499	218·36
„ R	35	504	214·71
„ O	48	499	213·83
„ E	27	494	210·24
„ P	23	477	203·71
„ I	41	500	201·28
„ A	27	434	199·66
„ N	27	475	192·11
„ G	50	406	177·67
„ B	60	435	177·55
„ H	26	386	164·32
„ L	34	395	162·40
„ J	31	368	155·16
„ K	40	354	145·48
„ S	21	328	137·45

Average Production of all Units—continued.

Waroona "B."	No. of Cows.	Milk Av. gals.	Butter-fat Av. lbs.
W. R. Foster ...	32	606	265
R. C. Eastcott ...	30	526	241
E. B. & H. H. McNeill	67	539	228
Herd C	28	501	220
„ F	28	494	218
„ L	37	468	209
„ K	30	491	204
„ M	74	423	200
„ G	29	441	194
„ E	31	401	186
„ D	30	404	185
„ B	26	424	183
„ I	35	421	181
„ Q	28	419	168
„ P	41	337	134
„ A	20	213	92

Bridgetown "N."	No. of Cows.	Milk Av. gals.	Butter-fat Av. lbs.
H. G. Letchford ...	35	571	253·57
V. Dezotti	42	497	232·80
J. C. Williams ...	46	446	216·90
Herd U	17	412	196·60
„ E	22	432	190·00
„ R	25	492	188·30
„ H	42	430	182·00
„ O	37	400	180·70
„ K	34	396	158·40
„ C	27	336	153·70
„ Q	61	396	152·50
„ G	48	388	151·80
„ A	12	319	148·30
„ L	36	330	147·50
„ M	17	364	140·80
„ F	33	312	139·30
„ T	34	328	137·50
„ P	19	285	126·70
„ J	35	321	125·40
„ B	34	266	111·20
„ X	14	280	106·40

Pinjarra "A."	No. of Cows.	Milk Av. gals.	Butter-fat Av. lbs.
L. A. House	18	595	293
D. G. Spark	29	585	288
V. A. Humphrey ...	32	588	236
Herd M	23	543	226
„ A	32	490	213
„ Q	57	504	211
„ B	56	564	207
„ R	29	422	200
„ I	34	379	178
„ P	27	428	162
„ C	35	435	159
„ J	24	357	154
„ O	56	323	149
„ D	30	382	147
„ G	26	342	145
„ K	40	292	143
„ N	23	347	134
„ H	25	253	110

Manjimup "O."	No. of Cows.	Milk Av. gals.	Butter-fat Av. lbs.
A. J. S. Angel ...	35	495	226·60
M. Kilrain	23	516	219·90
A. C. Head	21	462	208·20
Herd N	26	496	194·90
„ T	22	402	192·50
„ B	32	453	189·30
„ F	10	414	188·70
„ W	34	390	177·06
„ G	28	460	174·10
„ E	22	380	169·80
„ S	37	367	167·60
„ J	28	371	165·80
„ Y	26	379	160·60
„ U	49	391	159·50
„ P	26	454	157·90
„ D	14	351	157·00
„ K	39	358	149·80
„ A	29	322	142·10
„ M	36	329	136·20
„ X	35	334	122·20
„ L	16	287	118·90
„ R	15	275	118·60

Average Production of all Units—continued.

Denmark "W."	No. of Cows.	Milk Av.	Butter-fat Av.
		gals.	lbs.
W. Middleton ...	23	537	274·33
H. S. Redman ...	22	485	238·99
R. Fowler	17	471	233·51
Herd J	18	558	225·53
„ E	31	567	223·97
„ C	12	503	218·67
„ P	24	469	209·61
„ R	17	401	197·49
„ W	24	407	192·75
„ Z	19	410	191·15
„ G	36	436	190·25
„ L	21	373	185·55
„ N	38	386	170·51
„ M	25	385	162·40
„ B	8	367	158·13
„ S	13	327	152·41
„ D	19	332	145·55
„ T	7	331	143·90
„ F	34	302	138·53
„ Q	13	303	127·07

Metricup "F."	No. of Cows.	Milk Av.	Butter-fat Av.
		gals.	lbs.
V. R. Bunbury ...	67	776	313·00
D. H. Bell	13	759	312·54
N. L. Murdock ...	21	566	288·00
Herd M	16	588	268·06
„ A	31	589	258·26
„ S	24	471	248·50
„ B	25	487	232·80
„ C	23	505	232·74
„ E	17	477	215·94
„ O	23	472	207·70
„ T	48	440	202·02
„ G	26	415	201·50
„ D	21	452	200·43
„ V	17	389	194·06
„ H	31	379	181·51
„ U	32	375	175·22
„ I	26	341	155·65
„ J	14	318	149·00
„ P	16	289	140·31
„ Q	10	266	128·20
„ K	15	296	127·07
„ W	11	264	126·72
„ F	14	257	119·14

Nannup "U."	No. of Cows.	Milk Av.	Butter-fat Av.
		gals.	lbs.
F. Gianoni	39	599	272
S. Pedretti	21	611	259
N. Hutchins	29	542	244
Herd B	38	472	201
„ L	20	392	197
„ D	35	485	190
„ E	39	422	188
„ N	15	404	185
„ G	22	389	169
„ F	42	426	168
„ T	26	355	166
„ H	29	354	157
„ S	40	396	154
„ M	28	325	153
„ X	52	367	149
„ P	26	372	144
„ V	14	301	140
„ R	24	359	139
„ I	23	300	132
„ J	48	274	128
„ W	14	281	119
„ Y	29	328	118
„ O	22	244	102

Forest Grove "K."	No. of Cows.	Milk Av.	Butter-fat Av.
		gals.	lbs.
A. Millar	51	516	259
R. W. Gregson ...	24	546	259
J. H. Oldfield ...	39	530	248
Herd C	19	504	246
„ S	26	500	223
„ M	23	451	216
„ V	37	409	208
„ N	53	435	198
„ F	17	421	190
„ H	18	359	173
„ J	27	370	165
„ O	39	362	164
„ E	39	371	162
„ B	38	343	157
„ G	16	343	155
„ T	23	316	147
„ Y	36	342	140
„ P	36	326	137
„ R	32	258	135
„ Q	24	311	132
„ Z	14	279	126
„ X	28	261	106
„ L	1	213	76
„ X	7	106	68
„ W	14	104	51

Average Production of all Units—continued.

Albany "T."	No. of Cows.	Milk Av. gals.	Butter-fat Av. lbs.
Farr Bros.	30	536	250
F. V. Hortin ...	25	586	237
F. Allwood	29	490	230
Herd K	21	486	229
„ U	14	498	219
„ G	39	447	199
„ B	29	414	189
„ A*	17	409	185
„ X	8	449	174
„ M	24	367	166
„ V	13	390	166
„ E	8	370	161
„ H	42	365	156
„ N	15	380	156
„ S	22	340	146
„ Z	26	317	135
„ D	22	363	133
„ O	27	290	124
„ Y	22	319	101
„ P	30	223	99
„ R	25	214	91
„ J	17	176	69

* Inverted.

Rosa Brook "J."	No. of Cows.	Milk Av. gals.	Butter-fat Av. lbs.
R. J. Henderson ...	15	565	269
F. Doak	18	552	260
G. Snedden	15	568	250
Herd B	26	527	245
„ R	35	530	235
„ O	16	466	229
„ U	56	489	220
„ C	24	470	218
„ K	37	490	216
„ L	24	457	212
„ S	49	466	201
„ X	24	446	197
„ E	27	433	196
„ Q	34	400	192
„ V	19	390	189
„ A	22	456	188
„ H	32	409	182
„ D	24	388	179
„ P	28	412	178
„ F	30	437	174
„ G	37	365	166
„ I	14	348	164

Cowaramup, North "G."	No. of Cows.	Milk Av. gals.	Butter-fat Av. lbs.
T. H. M. Lefroy ...	25	625	282
J. Lefroy	27	589	281
W. B. & R. L. Blaikie	40	569	277
Herd Z	11	523	262
„ C	24	545	245
„ R	14	572	244
„ F	23	541	237
„ S	16	455	234
„ A	31	471	231
„ K	27	538	230
„ W	34	508	229
„ G	19	509	226
„ P	21	471	223
„ E	26	467	221
„ Y	61	469	219
„ H	20	435	209
„ M	24	439	203
„ D	33	501	196
„ X	40	450	192
„ J	18	395	180
„ O	12	252	114

Cowaramup, South "H."	No. of Cows.	Milk Av. gals.	Butter-fat Av. lbs.
G. S. Blaikie ...	30	688	295
A. Millar	29	523	265
L. F. Arthur ...	22	568	248
Herd C	26	492	243
„ B	48	591	238
„ K	26	505	238
„ E	23	482	225
„ N	28	478	215
„ I	20	509	210
„ D	40	506	199
„ O	15	426	186
„ F	31	368	184
„ H	48	374	172
„ J	30	486	165
„ M	21	354	159
„ Q	20	217	159
„ P	24	323	146

Donnybrook "L."	No. of Cows.	Milk Av. gals.	Butter-fat Av. lbs.
O. Foan	24	691	344
G. Layman	44	557	292
A. Clifford & Sons ...	21	496	233
Herd C	25	425	223
„ M	19	469	220
„ A	24	418	209
„ D	27	415	208
„ S	18	425	196
„ V	38	493	193
„ B	40	397	181
„ H	33	395	176

Donnybrook "L."—*continued.*	No. of Cows.	Milk Av. gals.	Butter-fat Av. lbs.
Herd X	39	390	173
„ J	21	353	173
„ P	16	338	170
„ T	16	323	158
„ F	21	347	155
„ K	26	307	152
„ W	24	299	145
„ E	30	273	141
„ R	15	307	135
„ G	21	265	129
„ O	16	257	128

LOCALLY GROWN LEGUMINOUS SEEDS.

THEIR COMPOSITION AND FOOD VALUE.

By

L. C. Snook,

Animal Nutrition Officer.

There is now a world-wide shortage of protein-rich foodstuffs and this shortage is likely to persist for some years. Poultry farmers and dairy men in this State have already felt the effect of this shortage and additional supplies of protein-rich food would be very welcome. The position could be made much easier by the more extensive growth and use of leguminous seeds. From time immemorial beans, peas and similar pulses have formed an important part in the diet of man and beast. If leguminous seeds could be grown extensively in this State they would be of great value to stock of all types. This paper has therefore been prepared to draw attention to the composition of locally grown leguminous seeds and to emphasise their value to the farmer.

Material Used.—Since 1932, the author has at various times analysed samples of leguminous seeds. The Government Chemical Laboratories have likewise at various times analysed samples submitted by the Department of Agriculture These analyses indicate that some Western Australian seeds are outstanding in nutritional value and it is important that this fact should receive publicity. For this reason the various data have been sorted out and listed in the various appendices to this paper.

As the samples were collected over a period of years from farmers throughout the agricultural areas, the figures quoted should give an index of the variability (if any) found in the seeds of the same species when grown in different years or in different places. It will be seen from the appendices that the compositions are remarkably uniform and the average values recorded in Table I. would seem to give a very reliable indication of the composition of the various species wherever grown in South-West Australia.

The various legumes will be discussed in the order in which they are listed in Table I, page 301.

FIELD PEAS. (*Pisum arvense.*)

Field peas have been grown extensively for many years in Western Australia and in favoured areas have proved a very profitable crop, particularly for fattening late lambs or building up pregnant ewes during the summer months. For this purpose the pea crop, generally sown with oats, is allowed to mature, the stock being admitted to eat the dry seeds and plant material, when other grazing has deteriorated in nutritive value. Obviously the seeds constitute the most nutritious portion of the crop. Two major disadvantages limit the growth of field peas for this purpose : the plants do not readily recover if grazed while green and the seeds often become heavily infested with pea-weevil. Pea crops are also subject to other pests such as black stem rot and the attacks of cut worm. The analytical data in this paper disclose another disadvantage ; the seeds of the field pea contain considerably less crude protein than other leguminous seeds which could be grown.

TABLE I.

LEGUMINOUS SEEDS.

Average Composition when grown in Western Australia.

Legume.	Number of Samples Analysed.	Crude Protein (N x 6·25).	Fat (Ether Extract)	Crude Fibre.	Carbohydrate (N free extract).	Ash	Calcium.	Phosphorus (P)
Field Pea—"White Brunswick" (*P. arvense*)	8	23·6	1·7	5·8	65·7	3·2	0·07	0·40
West Aust. Blue Lupin (*L. varius*)	15	34·0	2·5	19·5	40·8	3·2	0·16	0·39
New Zealand Blue Lupin (*L. augustifolius*) ...	4	36·3	3·6	13·6	43·8	2·7	0·19	0·27
Yellow Lupin (*L. luteus*)	5	42·6	4·4	16·2	32·9	3·9	0·27	0·42
Tangier Pea (*L. tingitanus*)	6	40·4	1·1	5·2	48·7	4·6	0·13	0·33
VETCHES GROWN AT MURESK—1945.								
Palestinian Vetch (*V. dasycarpa*) ...	1	32·2	1·0	5·4	58·9	2·5	0·15	0·30
V. monantha ...	2	31·8	1·1	3·4	60·1	3·6	0·12	0·47
Muresk Vetch (*V. sativa*)	1	30·2	1·0	6·0	58·2	4·6	0·21	0·46
Avondale Vetch (*V. sativa*)	1	30·2	1·2	3·8	62·4	2·4	0·11	0·27
Chickling Vetch (*L. sativus*)	1	30·1	1·0	6·3	57·4	5·2	0·15	0·44
L. ochris	2	27·6	1·6	6·0	61·5	3·3	0·17	0·36
FOR COMPARISON.								
F.A.Q. Wheat grain ...	7	11	1·5	2	84	1·5	0·04	0·24
Linseed Meal	...	33	4·4	11	44·8	6·8	0·05	1·25

In Appendix I., the analyses of eight sample of "White Brunswick" field peas are recorded. There is a striking uniformity in composition, despite the fact that the samples were collected over a period of years from districts with markedly different climatic conditions. The lack of variation in protein content is particularly interesting—six of the eight samples contained between 22 and 23% crude protein in the dry matter—in view of the fact that the protein content of cereal grains varies enormously from district to district ("Nabawa" wheat grown at Merredin over five years, averaged 15% crude protein in the dry matter compared with the 9% found in "Nabawa" wheat grown at Wongan Hills during the same years. Snook, 1939.)

At the present time farmers are particularly concerned with the protein, phosphorus and calcium contents of feeding stuffs. It can be seen from Table I. that field peas are quite a good source of crude protein containing about 23% compared with the 11% present in F.A.Q. wheat (average over seven years). The protein in peas has always been accepted as being of excellent quality and although of recent years workers have stressed that certain leguminous seeds are lacking in essential sulphur-containing amino-acids (Block & Mitchel, 1946: Lugg & Weller, 1944) the fact remains that the seeds of the field pea are a very valuable supplement to stock on dry feed. The only point at issue is: can peas be replaced by a better legume.

Pea seeds are a good source of phosphorus, containing more than half as much again (0·40% P in the dry matter) as F.A.Q. wheat (0·24% P in dry matter).

It is interesting to note that pea seeds are deficient in calcium, containing only 0·07%, which is very little better than the average cereal grain. Fortunately leguminous roughage is particulary rich in calcium, this being of particular value to high producing dairy cows for that reason.

West Australian Blue Lupins, September, 1947.
Growing on unfertilized sandy soil at Animal Health Laboratory, Nedlands.

WEST AUSTRALIANS BLUE LUPINS (*Lupinus varius*).

The use of lupin seed as an important sheep food is apparently peculiar to Western Australia. In other countries lupins have long been used to build up inferior soils, and as a green manure in orchards, but otherwise are generally referred to as a source of dangerous glucosides rather than nutritious seeds. However, in Western Australia, lupins have proved themselves of great value, not only to reclaim poor quality wind-eroded country, but also to provide a much needed protein—rich supplement during the dry summer months. The variety grown, *Lupinus varius*, is a robust blue-flowered plant. Except in the seedling stage, it is rarely eaten by stock when green, being left unharmed to produce a prolific crop of seeds. It is the seed and dried plant material which constitute the supplement so relished by sheep as the summer progresses.

In Appendix II. the compositions of 15 samples of lupin are recorded. While not as constant in composition as field peas, the variation seen is not great considering the varied origin. The Subiaco samples, for example, were obtained from good stands of lupins growing on virgin coastal sand; despite complete lack of fertiliser or cultivation, the poorest sample contained 30% crude protein and 0·39% P. It seems that the roots of the lupin plant are very good at foraging, so that maximum use can be made of such food constituents as are in the soil.

As can be seen from the summary in Table I., the West Australia Blue Lupin is very rich in crude protein, averaging 34% which is half as much again as is present in field peas. This high protein content no doubt contributes largely to the high nutritive value of the seeds, as during the long summer lack of protein is the most serious deficiency seen in West Australian pastures. It should be emphasised that these lupins contain more crude protein than commercial linseed meal.

Lupin seeds are also a useful source of mineral matter, containing as much phosphorus as field peas and twice as much calcium. It is indeed surprising that lupins growing on phosphate deficient soils can concentrate so much of this vital element in their seeds. As a point of scientific interest it may be noted that lupin seeds contain a much lower proportion of phytin phosphorus than do most other seeds and grains (Snook, 1938).

NEW ZEALAND BLUE LUPIN (*L. augustifolius*).

The New Zealand Blue Lupin is now extensively grown as a green manure crop in orchards and vineyards. It is possible that this strain could be grown as a source of lupin seeds for sheep in districts where the common blue lupin does not thrive. As can be seen from Table I., the seed of the New Zealand variety appears to be somewhat richer in crude protein than the local strain and contains definitely less crude fibre. It does not follow, however, that the New Zealand strain is to be preferred. In the first place it has to be proved that the seeds of imported varieties are palatable. A food is useless, no matter how nutritious it may be, if stock refuse to eat it. It is common knowledge that many varieties of lupins grown overseas contain bitter alkaloids which make them distasteful to stock and poisonous if eaten Careful trials will therefore be necessary before any new variety of lupin can be accepted as a source of food for stock.

In an effort to obtain information concerning the presence of undesirable alkaloids (bitter substances, mostly poisonous) in lupin seeds, a number of analyses were carried out by the Government Chemical Laboratories for the Department of Agriculture. A summary of the results is given in Table II.

TABLE II.

ALKALOIDS PRESENT IN LUPIN SEEDS.

	Percentage lupanin in seeds grown at—	
	Wongan Hills.	Merredin.
Lupinus termis	2·6	2·7
N.Z. Blue lupins	1·1	1·4
	1·4	1·4
W.A. Blue lupins	0·4 (5 samples)	0·6
"Sweet" Yellow Lupin	0·2	...

If the percentage of lupanin does give a reliable index of the presence of dangerous substances then the above figures indicate that the New Zealand variety may not be altogether successful as a source of sheep feed.

YELLOW LUPIN (*Lupinus luteus*).

Although it is realised that the seeds of bitter yellow lupins have no value as a foodstuff without treatment, it is interesting to study the composition as set out in Appendix IV. and summarised in Table I. It will be seen that, on the information at present available, these seeds contain more crude protein than any other seed grown in this State. But despite the apparent high food value, the seeds are useless and illustrate all-too-well that the first necessity required of a food is that it should be palatable and free from poison. The seeds of the common yellow lupin are very bitter because of the presence of poisonous alkaloids. Plant breeders, however, are studying "sweet" strains of this legume and these may prove very valuable as stock food.

As a point of interest it should be noted that "sweet" yellow lupins grown in W.A. from seed imported from Germany had a composition almost identical with the original seed except that the German seed contained double the amount of phosphorous. This is the first example seen where a leguminous seed shows the same trend characteristic of cereals. It has been shown (Snook, 1939) that cereal grain grown in W.A. contains only about half the phosphorous usually found in British cereals.

TANGIER PEA (*Lathyrus tingitanus*).

In this State, farmers have grown Tangier Peas successfully for many years. In spring, this legume makes phenomenal growth, producing heavy yields of palatable nutritious greenstuff. In the Avon valley, for example, Tangier Pea plants will keep green until mid December, providing succulent feed long after most other herbage is dry. Under favoured conditions, seed production is heavy, a sample threshing of the dry plant material harvested at Muresk in 1946 yielding seed at the rate of 28 bushels per acre. When stock are admitted all the Tangier Pea plant is eaten—leaves, seeds and stems.

As can be seen from Appendix V., the Tangier Pea seed is very rich in crude protein, containing about 40 per cent., which is almost double the amount present in field peas and one-third more than is present in linseed meal. Such seeds are obviously a very valuable protein-rich concentrate and it is indeed a pity that practical difficulties in harvesting the seed have so far prevented the sale of Tangier Peas for feeding to livestock. In fact, it is the high price of the seed which has, to date, limited the more extensive planting of Tangier peas for green feed. Dairymen in Queensland were most enthusiastic about Tangier Peas as a source of greenstuff for milch cattle but seem to have ceased making enquiries for seed in Western Australia as regular supplies could not be obtained, although £3 per bushel was offered. In view of the heavy yields of seed grown locally in small plots, it does seem strange that more farmers have not found it profitable to grow Tangier Peas

for sale as seed, or that farmers growing the crop for grazing have not been able to conserve sufficient seed for their own use. The green plants are very palatable and will be eaten out if accessable to stock. It seems that the closing up of a small area is all that is required to provide the farmer with continued stocks of seed.

Bulk Crop of a Selected Strain of Common Vetch.
Grown on sandy soil, Wongan Hills Research Station. Planted on 28th May, at rate of 35 lbs. seed and 112 lbs. superphosphate per acre. Photo taken on 20th October, 1947.

VETCHES (*Vicia spp.*).

Vetches have been insignificant members of West Australian pastures since farming was commenced, but had not attracted serious attention until Mr. E. Bailey, Plant Introduction Officer, C.S.I.R., noted that a strain of the Common Vetch (*V. sativa*), which had been growing at Muresk for many years appeared to be definitely superior to the field pea as a source of fodder and seed. This vetch has the particular advantage of flowering early, so that a good crop of seed is assured under wheat belt conditions. Other strains of vetch have since been introduced by Mr. Bailey, and it seems certain that some or all of these will become important forage crops. The Department of Agriculture procured seeds of a vetch which had proved promising at Hawkesbury College, N.S.W. This also is a selected "strain" of the Common Vetch ; it has the advantage of early maturity and an erect habit of growth which should facilitate harvesting by machinery. In the above illustration is shown part of the five acres being grown this year at Wongan Hills Research Station. The cultivation of this crop is discussed in a separate article in this Journal. Seeds of this vetch were also planted on 22nd June, in poor quality virgin sand at the Animal Health Laboratory at Nedlands. Despite this late sowing, the small plot grew well with no other attention than the application of a little superphosphate. It seems that this strain of vetch will prove particularly useful on light land and in low rainfall areas. It is quick maturing and may prove a useful cover crop in wind-swept or eroded areas. No tests have been carried out to determine recovery after grazing, but stock are very fond of the green plant which therefore needs protection during the latter part of the season, if seed is desired.

Palestinian Vetch.

Planted on virgin sandy soil at Nedlands on 1st April, these two plants were cut to ground level in June and July. Photo taken on 6th October, 1947.

In small plot trials at Muresk in 1946, another variety, the Palestinian Vetch (*V. dasycarpa*), proved outstanding, yielding seed at the rate of 64 bushels (3,900 lbs.) per acre and dried roughage at the rate of nine tons per acre. It should be stressed that these yields were obtained from small plots where plants usually do much better than under field conditions but even so, the yields are most impressive. A few seeds of this Palestinian vetch were planted on poor, sandy soil at the Animal Health Laboratory in April, 1947, and grew profusely although surrounding weeds were heavily infested with Red Mite. The plants shown in Illustration II., were twice cut to ground level but recovered well and promise to give a heavy yield of seed. It was noticed that Palestinian vetches at Wongan Hills were flowering in mid October, by which time the Hawkesbury strain of the common vetch had completed setting seed. This indicates that the Palestinian vetch may be too late a variety

to set seed satisfactorily under wheat belt conditions. Experiments over a period of years will be needed to determine this point. At present, however, it can be stated that the Palestinian vetch produces an abundance of very palatable green feed and under suitable conditions will give heavy yields of seeds. On present indications it seems that selected strains of the common vetch will prove most useful in the drier wheat belt areas, while the Palestinian vetch will provide both green-feed and seed in districts with more prolonged growing periods.

Vetches possess many advantages—they are hardy, resistant to red mite and black stem rot, and the seeds are not affected by the pea weevil. The green plant is greatly relished by stock and from the limited experience now available it seems that this crop will respond well after grazing. Naturally the yield of seed would be expected to fall if the crop is grazed but vetches possess the definite advantages over field peas in that they can be sown early, grazed, and then be shut up to set seed.

Are Vetch Seeds Poisonous?—Occasional references can be found in Veterinary literature to the deaths of livestock following consumption of vetch seed. Interestingly enough, most of these references are old, they come from abroad, and no case of sheep poisoning has been cited. Vetch seeds contain cyanogenic glucosides from which prussic acid can be liberated ; this may produce cyanide poisoning. Obviously, it is important to determine if the strains of vetch showing promise in this State are in any way dangerous.

The seed is the source of danger and it seems that large amounts have to be eaten in a short space of time if toxic results are to follow. Only limited amounts of seed have so far been available, hence it has not been possible to carry out feeding tests on large animals. It is planned to do this after the current harvest. Meantime, experiments have been carried out using mice and guinea pigs. Chemical determinations have been made also.

Young mice were starved and then given as much crushed vetch seed as they would eat. No other food was supplied but the animals continued to grow on this restricted diet. No harmful effect was observed after 14 days feeding.

Guinea pigs would not readily eat the vetch seeds but these animals were very fond of the fully grown seeds in half-ripe pods. Guinea pigs showed no symptoms after consuming this ration for two days. This test is of considerable practical interest as if livestock gain access to a field of vetches just as the pods are ripening, they could consume large quantities of seed. Even under these conditions, it does not seem that the crop will be dangerous.

Qualitative chemical tests revealed that the strains of the common vetch selected by Bailey and Millington, both contained substances producing prussic acid. In contrast, the Palestinian Vetch and another importation (*V. monantha*) seemed quite free of dangerous compounds. This suggests that the plant breeder may be able to select toxin-free strains.

Samples of the common vetch were submitted to the Government Chemical Laboratory so that the amounts of prussic acid liberated could be determined. These were found to contain up to 0·03 per cent. HCN. in the dry matter.

It is disconcerting to know that some vetch seeds do contain significant amounts of cyanogenic glucosides, as it is always possible that under certain climatic and soil conditions, more dangerous amounts may be produced. Fortunately, tests so far made do not indicate that vetch seeds will be dangerous in practice. Franklin and Reid (1944) found that commercial linseed meals and linseed nuts contained

from 0·05 to 0·06 per cent. HCN. in the dry matter. This is double the maximum amount so far found in West Australian vetch seed. It was only by force-feeding large amounts of linseed meal to starving sheep that deaths could be produced.

Cyanide poisoning most commonly occurs when hungry stock engorge themselves with a potentially dangerous food. Such engorgement will rarely be possible with vetch seed and even if it does occur, the analytical data at present available imply that the risk will be slight. As soon as sufficient seed is available feeding tests will be carried out at this Laboratory, using large animals and poultry. Such tests are necessary in view of the hope that it may be found possible to harvest vetch seed cheaply for use as a protein-rich concentrate for dairy cows and poultry. As can be seen from Table I., vetch seeds should be of high food value to growing and lactating animals.

CHICKLING VETCH (*Lathyrous sativus*).

This so-called vetch is of the same family as the Tangier Pea. In Northern Africa and India the seeds have for centuries been used as stock food and to supplement the diets of poor people. Mr. Bailey has made available samples of seed from Chickling Vetches grown at Muresk.

In the tests so far conducted in Western Australia the Chickling vetch has proved disappointing as a source of green material but the yields of seed have been impressive. Small plots at Muresk in 1946, yielded seed at the rate of 50 bushels (3,250 lbs.) per acre compared with 64 bushels from the Palestinian vetch and 45 bushels from the Muresk vetch. The seed has much the same composition as vetch seed but caution will need to be observed in feeding this product to stock. There are many references in the literature (*see* Hurst, 1942) to chronic poisoning ("lathyrism") following the continued consumption of seeds of the Chickling vetch and although tests made at this Laboratory indicate that locally grown seeds are harmless when fed to mice, there seems little point in introducing this suspect legume unless it possesses some very definite advantage. In this regard it may be recorded that Chickling vetches sown in April, 1947, at the Animal Health Laboratory did not thrive and dried up during the dry weeks of August. Tangier Peas planted nearby have grown well and are still growing at time of going to Press. For the present, farmers are not advised to grow Chickling vetch.

LATHYRUS OCHRIS.

This is another relative of the Tangier Pea which has been imported for trial. It shows some promise as a producer of seed in the Avon Valley but further trials will be needed to determine its value.

Plants of this species grown at the Animal Health Laboratory, Nedlands, did not thrive. As far as can be judged from Table I., the seeds are somewhat inferior to vetches in feeding value.

DIGESTIBILITY OF LEGUMINOUS SEEDS.

In assessing the value of a foodstuff, it is important to know just how digestible are its various components. This is particularly important where roughages are concerned ; hay, for example, can vary enormously in value according to stage of growth at time of cutting. Fortunately, the nutrients present in seeds and grains are in most cases readily digested and the ease of digestion is much the same wherever the seeds may be grown. Table III. has been prepared to show the digestibility of the material in leguminous seeds when fed to ruminants. It will be noticed that workers in Germany and the U.S.A. arrived at very similar figures for the two legumes quoted and it seems fairly safe to assume that locally grown leguminous seeds will have much the same digestibility.

Table III.

DIGESTION CO-EFFICIENTS FOR LEGUMINOUS SEEDS FED TO RUMINANTS.

	Crude Protein.	Carbo-hydrate.	Fat.	Fibre.
Peas—				
Germany (Kellner, 1926)—Range in four investigations	83–90	93–94	55–75	26–66
U.S.A. (Henry & Morrison, 1928)—Average of two investigations	83	94	55	26
Figures used for local field peas	85	94	60	50
Soya Bean—				
Germany (four investigations)	87–91	62–76	89–94	71
U.S.A. (seven investigations)	91	81	92	75
Vetch Seed—				
Germany (two investigations)	88	100	92	90
Lupin Seed—				
Germany (twelve investigations)	85–96	75–100	71–96	77–100

Protein Quality in Leguminous Seeds.

It is now generally realized that proteins in different foods do not have the same value when fed to livestock. This is because some proteins are lacking in one or more of the essential amino-acids. Zein, the major protein in maize grain, is the classical example of a poor-quality protein, as it is lacking in tryptophane and lysin, both of which are essential amino-acids. It follows that attention must always be paid to the "quality" or "biological value" of the protein when estimating the value of a foodstuff.

Attention is drawn to this subject because various workers, Lugg *et al.* (1944, 1945) in particular, have stressed the fact that the proteins in certain leguminous seeds are comparatively deficient in the sulphur containing amino-acids, particularly methionine. The inference has been drawn that leguminous seeds may not be such useful foods as had been generally accepted.

It should be remembered, however, that most single foodstuffs have one or more deficiences, and the art of feeding is to blend ingredients so that the deficiencies are cancelled out. For example, cereal grains are deficient in lysin, a very important amino-acid, whereas leguminous seeds are rich in this essential. It follows that a supplement of leguminous seeds will improve a cereal ration for this reason. In a similar manner the shortcomings of leguminous seeds may be corrected by other foodstuffs in the diet.

In practice, leguminous seeds have proved of great value as stockfood in Western Australia. Farmers have found that sheep, in particular, produce excellent mutton and wool wherever peas or lupin seed form part of the diet. Not only do the stock thrive, but the fertility of the land always increases when legumes are established. It follows that if productive strains of vetches can be selected, or simpler methods of handling the Tangier Pea can be evolved, the farmer and the State will both benefit. Field peas were a great disappointment to many farmers this season, but there is real reason to hope that much more dependable, and even more nutritious, legumes may soon be available for use in the wheat belt.

SUMMARY.

Analytical data are presented showing the composition of various leguminous seeds grown in Western Australia.

Seeds of the same species grown in different years and in different parts of the State, were remarkably uniform in composition. The average values are tabulated.

Tangier Peas (*Lathyrus tingitanus*) were found to contain more crude protein than any other edible seed investigated, the six samples averaging 40 per cent. in the dry matter.

The possible value of selected strains of vetches (*Vicia spp.*) as a source of greenfood and protein-rich seed, is discussed.

Seeds of the Common Vetch (*Vicia sativa*) contain cyanogenic glucosides but chemical and feeding tests do not indicate that the seeds will be dangerous. There is no suspicion that any part of the vetch plant other than the seed, is likely to be poisonous.

Some consideration is given to the nutritive value of the protein in leguminous seeds.

It is suggested that more dependable legumes than field peas (*P. arvense*) may be grown for stock food in Western Australia.

ACKNOWLEDGMENTS.

Mr. E. Bailey, Plant Introduction Officer, C.S.I.R., first drew the author's attention to the potential value of vetches as a source of fodder and seed. Thanks are also due to Mr. Bailey for samples of seed used in chemical and feeding tests.

Certain of the legume samples were obtained from the various State Research Stations. I wish to thank Mr. I. Thomas, Superintendent of Wheat Farms, for arranging for me to receive these samples.

A proportion of the analytical work recorded in this paper was carried out for the Department of Agriculture by the Government Chemical Laboratories, and appreciation is expressed for this help and co-operation.

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APPENDIX I.

COMPOSITION OF SEEDS.

FIELD PEAS "WHITE BRUNSWICK" (*Pisum arvense*).

Percentage Composition—Dry Matter basis.

Source of Sample.	Crude Protein (N x 6·25).	Fat (Ether Extract).	Crude Fibre.	Carbohydrate (N-free Extract).	Ash.	Calcium (Ca).	Phosphorus (P).
Merredin (1932)	26·5	...	...	...	3·65	0·08	0·36
York (1926)	22·3	1·5	5·5	67·8	2·84	0·07	0·38
York (1933)	22·5	...	...	...	3·18	0·08	0·34
Burekup (1932)	22·6	...	...	...	3·34	0·08	0·41
Burekup (1933)	22·5	...	...	...	3·66	0·06	0·61
Burekup (1935)	22·7	...	...	...	3·52	0·07	0·47
Wonnerup (1933)	25·8	...	...	...	3·30	0·06	0·37
Kulja (1945)	22·9	1·8	6·0	66·6	2·74	0·07	0·23
Average 8 samples ...	23·5	1·6	5·8	65·8	3·3	0·07	0·40
Overseas analyses for Comparison.							
British (Marshall and Halnan, 1932)	26·2	1·8	6·3	62·4	3·3	0·10	0·46
U.S.A. (Yearbook, U.S.A., 1939)	25·7	1·3	6·5	62·9	3·6	0·09	0·44

APPENDIX II.

COMPOSITION OF SEEDS.

WEST AUSTRALIAN BLUE LUPINS (*Lupinus varius*).

Percentage Composition—Dry Matter basis.

Source of Sample.	Crude Protein (N x 6·25).	Fat (Ether Extract).	Crude Fibre.	Carbohydrate (N-free Extract).	Ash.	Calcium (Ca).	Phosphorus (P).
Merredin (1932)	36·0	...	...	...	3·00	0·19	0·41
Wongan Hills (1932) ...	34·4	...	...	...	3·67	0·15	0·34
Wongan Hills (1933) ...	36·3	...	...	...	3·85	0·16	0·44
Wongan Hills (1935) ...	32·7	...	...	...	2·63	0·16	0·26
Wongan Hills (1939) ...	34·1	2·6	19·3	43·0	3·00	0·13	0·32
Wongan Hills (1940) ...	32·5	2·3	18·8	43·4	3·00	0·13	0·32
Subiaco (1933)	36·9	...	...	...	2·44	0·24	0·36
Subiaco (1935)	33·2	...	...	...	2·71	0·19	0·34
Subiaco (1936)	30·0	...	...	...	2·63	0·23	0·39
Burekup (1932)	30·9	...	...	...	3·46	0·14	0·34
Burekup (1933)	33·3	...	...	...	4·02	0·18	0·61
Chapman (1932)	38·8	...	...	...	3·64	0·16	0·41
Forest Grove (1939) ...	35·4	2·3	22·0	37·4	2·9	0·10	0·30
Commercial (1939) ...	31·7	2·7	18·9	43·3	3·4	0·14	0·54
Agric. Dept. (1940) ...	32·5	2·5	18·6	43·3	3·1	0·15	0·41
Average 15 samples ...	34·0	2·5	19·5	40·8	3·2	0·16	0·39

Appendix III.

COMPOSITION OF SEEDS.

New Zealand Blue Lupins (*L. augustifolius*).

Percentage Composition—Dry Matter basis.

Source of Sample.	Crude Protein (N x 6·25).	Fat (Ether Extract).	Crude Fibre.	Carbohydrate (N-free Extract).	Ash.	Calcium (Ca).	Phosphorus (P).
Upper Swan (1939) ...	38·0	3·3	14·0	41·9	2·8	0·19	0·31
Guildford (1939)	33·8	4·3	14·0	45·2	2·7	0·16	0·24
Merredin (1940)	37·0	3·3	13·3	43·8	2·6	0·21	0·27
Wongan Hills (1940) ...	36·5	3·6	13·3	43·9	2·7	0·19	0·25
Average 4 samples ...	36·3	3·6	13·6	43·8	2·7	0·19	0·27

Appendix IV.

COMPOSITION OF SEEDS.

Yellow Lupins (*L. luteus*).

Percentage Composition—Dry Matter basis.

Source of Sample.	Crude Protein (N x 6·25).	Fat (Ether Extract).	Crude Fibre.	Carbohydrate (N-free Extract).	Ash.	Calcium (Ca).	Phosphorus (P).
Crawley (1939) *	45·0	3·7	16·5	31·1	3·7	0·20	0·45
Merredin (1940)	43·0	4·6	16·2	32·4	3·8	0·28	0·41
Wongan Hills (1940) ...	42·2	4·7	16·1	33·1	3·9	0·26	0·41
Dept. Agric. (1940) ...	41·4	4·3	16·0	34·4	3·9	0·30	0·41
Dept. Agric. (1940) ...	41·5	4·4	16·4	33·6	4·1	0·30	0·42
Average 5 samples ...	42·6	4·4	16·2	32·9	3·9	0·27	0·42
For Comparison. * Seed obtained from Germany (1939)	41·8	4·0	16·5	32·7	5·0	0·26	0·85

* "Sweet" variety.

Appendix V.

COMPOSITION OF SEEDS.

Tangier Peas (*Lathyrus tingitanus*).

Percentage Composition—Dry Matter basis.

Source of Sample.	Crude Protein (N x 6·25).	Fat (Ether Extract).	Crude Fibre.	Carbohydrate (N-free Extract).	Ash.	Calcium (Ca).	Phosphorus (P).
Dwarda (1933)	40·3	...	...	...	4·6	0·12	0·33
Dwarda (1934)	40·7	...	...	...	...	...	0·33
Dwarda (1935)	41·2	...	...	...	...	...	0·35
Dwarda (1945)	41·4	1·1	5·2	46·5	5·8	0·13	0·33
Wonnerup (1933)	39·0	...	...	...	3·5	0·14	0·69
Wonnerup (1935)	39·7	...	...	...	...	...	0·33
Average 6 samples ...	40·4	1·1	5·2	48·7	4·6	0·13	0·33

HERD RECORDING RESULTS AS A COMPARISON with Factory Returns—

R. A. PAUL, Assistant Superintendent of Dairying.

FREQUENTLY, members of the Grade Herd Recording Scheme attempt to compare and reconcile the butter-fat yields of their cows as given by the Herd Recorder, and the returns as received from the butter factory.

So numerous have been inquiries regarding this matter over the past few months, it was considered that an endeavour be made to show the farmers the futility of the comparison. The purpose of this article is to do just that to the satisfaction of both farmers and factory manager.

To enable a full appreciation of the facts, it is proposed to deal with the question from the following angles:—

1. The Daily Yield. 2. The Monthly Yield. 3. The Yearly Yield.

THE DAILY YIELD.

On this basis there should be and there is a very close agreement between the factory return and the Herd Recorder's results. Numbers of members who have been asked this question agree that the results are very close, sometimes the recorder's results are higher and at other times lower, but at all times the agreement is good.

This is to be expected where the whole of the two milkings at which the recorder has taken his samples are separated, kept apart from other cream and forwarded to the factory.

Even allowing for milk used for house and calf rearing and loss through the separator, results have been found to vary little.

THE MONTHLY YIELD.

Unfortunately this is the basis on which the majority make their comparison. It is unfortunate for the reason that it offers the greatest scope for variations, and it is the unit on which the herd recording results are measured.

Those who have had some experience of recording know that the herd is tested at approximately 30-day intervals, and the daily yield both of milk and butter-fat is multiplied by 30 to give the yield for the sub-period.

It is in discussing the factors which can affect the yield of a cow from day to day within this 30-day period, that it is hoped to point out the futility of a comparison between two entirely dissimilar services as given by the recorder and the factory.

In the first place it is desired to stress that the only accurate method of assessing a cow's production is to sample and test at each milking during the lactation period, if that were done a very close relationship would be found between the two results. However, that, of course, is not economically possible, but it has been found in practice that the average production of a cow for her whole lactation, as calculated in 30-day sub-periods is sufficiently accurate for comparative purposes. It is known, however, that the test for any one sub-period of 30 days may differ considerably from a true result obtained by carrying out the test each day.

The causes of such variations in the daily test are recognised by farmers, but perhaps it is not realised just how frequently these variations may occur or to what extent they can and do affect each individual test.

Daily variations may be due to one or more of the following causes:—

(a) *Weather Conditions.*—These do not continue uniformly throughout the month; extremes of heat, cold wind and rain affect both the quantity of milk and the percentage of fat in the milk.

(b) The pasture and feed conditions will almost certainly vary throughout the monthly period; this will give day to day changes in production which are multiplied by 30 for the sub-period.

(c) Cows that are tested just after calving, when in season, sick or otherwise upset are irregular in their yields for a period afterwards.

(d) Extra rations may be handed out just prior to and at testing time, so having the effect of raising production during the 24-hour testing period, and then taken away after the recorder's visit for the remainder of the sub-period.

(e) Palatability and quantity of water available may vary at and after the monthly visit of the recorder.

(f) It is possible that on recording days the herd is milked out with a little more care than is usually given.

As an illustration of the actual day to day variation which may occur in a herd of cows, the following record of a herd of 13 cows which was tested daily during one month at Vermont Experiment Station is given as an example:—

			(30-day sub-period.)
Date.	Milk. (lbs.)	Fat. (lbs.)	Fat. (lbs.)
1.	171	6.48	194.4
2.	182	7.64	229.2
3.	182	6.61	198.3
4.	187	7.42	222.6
5.	204	8.49	254.7
6.	220	9.39	281.7
7.	216	9.53	285.9
8.	228	9.92	297.6
9.	240	10.18	305.4
10.	237	10.62	318.6
11.	250	10.68	320.4
12.	246	9.84	295.2
13.	226	9.85	295.5
14.	248	10.94	328.2
15.	255	10.63	318.9
16.	243	10 04	301.2
17.	241	10.39	311.7
18.	248	10.86	325.8
19.	245	10.05	301.5
20.	264	10.33	309.9
21.	243	9.11	273.3
22.	241	10.34	310.2
23.	250	10.78	323.4
24.	262	10.74	322.2
25.	262	10.24	307.2
26.	272	10.99	329.7
27.	260	10.09	302.7
28.	255	11.78	353.4
29.	256	11.75	352.5
30.	262	11.50	345.0
Total	7,096	297.21	

It will be seen from the above table that on 20 days the fat as calculated for the 30-day sub-period is in excess of that actually produced daily for the 30 days, whilst on the other ten days it is below. The variation is considerable being from 103 lbs. below the actual yield to as much as 56 lbs. above, or an overall variation of 159 lbs. between the highest and lowest productions for the month estimated on the 30-day sub-period.

Variations such as the above are not uncommon under our own conditions, particularly in the early spring months, when the flush of pasture growth commences and again in the early summer months, when the feed rapidly dries off.

It is as well to bear in mind that provision is made in the rules to cover this as a 25 per cent. variation is allowed between two successive tests before the recorder is justified in believing the results abnormal.

From the foregoing it will be seen that it is neither possible nor desirable to compare the *estimated* monthly herd recorded production with the *actual* monthly factory return.

THE YEARLY YIELD.

As might be expected the causes of variations as discussed under the previous section do to a degree average themselves out over a full year's production, with the result that in practice it has been found the yearly production of a herd, as given by the Herd Recorder, will agree to within 5 per cent. to 7 per cent. of the return from the factory. Under farm conditions this is considered to be a sufficiently accurate guide as a means of comparing one cow with another.

Farmers have been heard to complain that on the basis of the yearly yield, they cannot reconcile the two results within several hundred pounds. Taking a 25-cow farm with an average of 200 lbs. per cow as estimated by the recorder, it will be seen that the yearly total fat produced on the farm equals 5,000 lbs. Supposing a 5 per cent. variation occurs, it would represent a total of 250 lbs. of fat over the whole production.

In concluding, it is desired to point out that herd recording serves a very useful purpose in aiding to increase herd production and yield of milk and butter-fat per acre. The system should be availed of to cut those losses brought about through under-feeding of high producing stock and the keeping of low producing stock to breed from and milk. Herd recording should not be carried on as a means of policing factory operations since for this purpose it is of little or no value.

SEED CERTIFICATION

Phalaris Tuberosa.

The certification of subterranean clover seed by the Department of Agriculture was commenced in 1934. In that year only the Dwalganup early strain was under consideration, but the scheme now includes Mt. Barker (midseason), Tallarook, Bacchus Marsh, and Yarloop (white seeded).

Following a request from Messrs. M. C. Fry and Sons, Donnybrook, certification will be further extended during the coming season to include Phalaris tuberosa. The main guarantee will be freedom from the annual Phalaris minor, but the certificate will also cover purity and germination. It is very pleasing to note the increased interest in the local production of agricultural seeds and there is no reason why the keen demand for such seeds as Wimmera rye grass, Phalaris tuberosa and lucerne should not be met from within the State.

DESTROY THAT FRUIT AND HELP CONTROL FRUIT FLY.

A SIMPLE INCINERATOR FOR ORCHARD OR GENERAL USE.

By W. C. Holland, Fruit Fly Inspector.

Owing to the ravages of Fruit Fly during the past few seasons, with the heavy losses resulting to growers individually and collectively, it will amply repay orchardists to give serious thought to the control measures employed with a view to the prevention of such losses in years to come.

With this pest, the old saying that "prevention is better than cure," certainly applies and prevention of further infestation would be obtained if all fruit which had been "struck" were effectively disposed of before the larvae emerged. All growers are therefore, advised to keep this point firmly in mind and make every endeavour to carry it out to the best of their ability during the harvesting season.

The procedure of careful destruction of waste and infested fruit, together with rigid orchard sanitation and regular application of the proper foliage baits recommended by the Department, will adequately control Fruit Fly, and make this present major pest become a relatively minor one in all our fruit growing districts.

During the harvesting season, and indeed throughout the year, the following precautions should be carried out by all pickers :—

1. Harvest all fruit as soon as it reaches a state of sufficient maturity, whether marketable or not.
2. Have a separate water-tight container for any fruit showing signs of fly. Do not drop this fruit on the ground.
3. Gather all windfalls regularly and destroy waste fruit immediately.

To try and assist growers in the fight against Fruit Fly, tests have been carried out with a home-constructed incinerator with very good results. The incinerator consists of a 44 gallon drum with the top removed ; the bottom and 2 feet of the sides are perforated with draught holes about one inch in diameter and five or six inches apart (see accompanying sketch).

Four short legs could be attached to the drum to raise it from the ground, or it may be stood on bars or even four bricks to provide adequate draught.

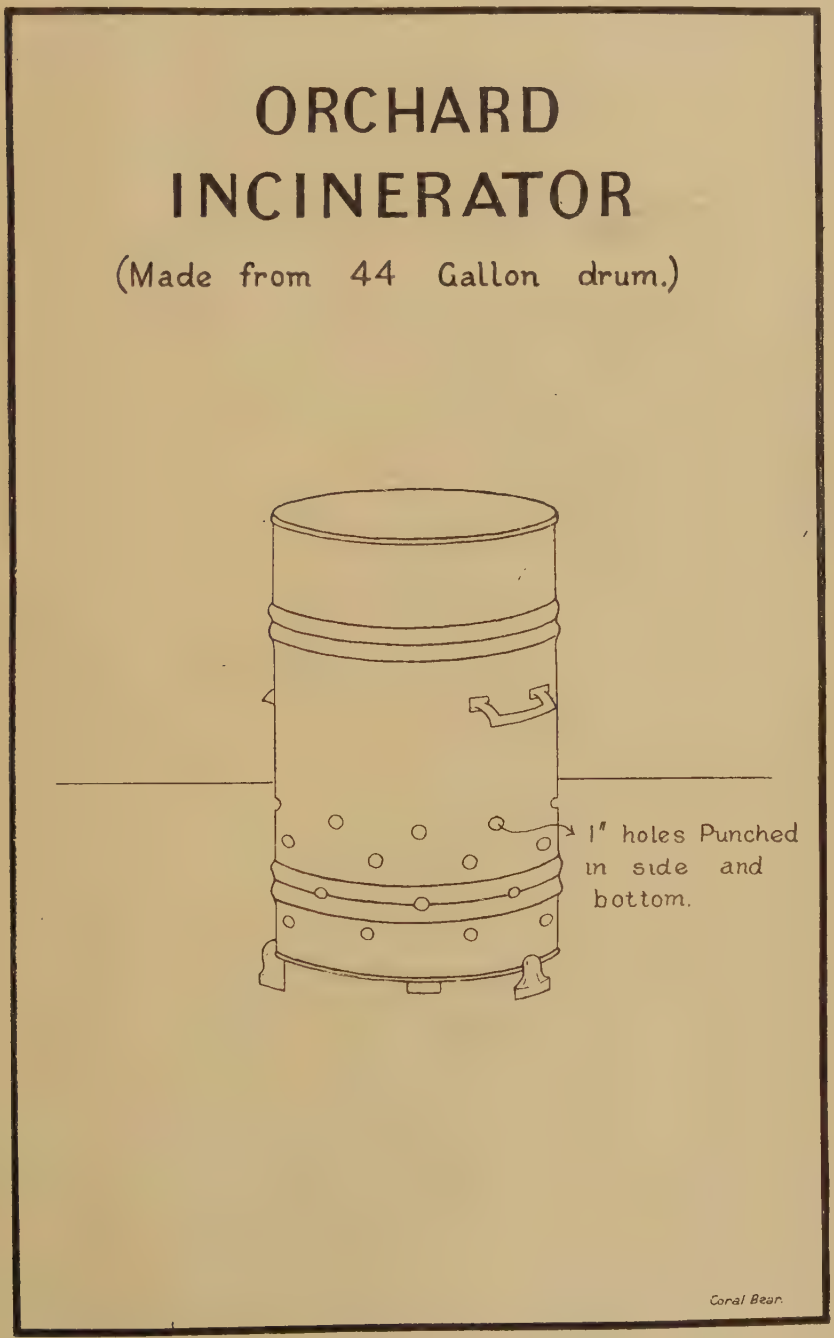
For convenience of handling and transport, a pair of handles or lengths of water piping welded to the side of the drum, prove most useful.

To operate the incinerator, stand two or three fairly long thick pieces of wood on end in the drum to form a vent and build a good fire in the bottom. When well alight, commence to add fruit until the drum is full, then place another drum with both ends removed on top to increase the draught and add more fruit if necessary. If only a small quantity of fruit is to be destroyed, one drum only is suitable, but the addition of the second one greatly improves the performance.

One grower recently destroyed 70 boxes of apples during a day by this means, and is so impressed that he is putting in a more permanent unit.

A surprisingly small amount of wood is consumed by this arrangement, and little or no attention is required once the fire is burning well, except the addition of further quantities of fruit from time to time. If large quantities of fruit are being destroyed, add more wood as required.

In conclusion, I wish strongly to recommend all growers to adopt the method described, as the cleanest, handiest and best way of disposing of infested and unwanted fruit, as well as other household and farm rubbish, which from a health standpoint, it is desirable to destroy by burning.



PURE BRED HERD RECORDING 1946-47

By M. Cullity, Superintendent of Dairying, and B. H. Drakes, Assistant, Dairy Records.

During the year, 517 cows from 35 herds completed test, compared with 424 cows from 34 herds the previous year.

This is an increase of 21.9% in the number of cows and is the highest number tested in any year since the inception of the Official Australian Pure-bred Dairy Cattle Production Recording Scheme in this State.

Of the above number, 57 cows were withdrawn for various reasons before completing 150 days under test, and their productions are not included in any of the averages.

The remaining 460 averaged 6,545 lbs. of milk, average test 4.56% and 298.53 lbs. butter-fat. This is an increase of 18.6 lbs. of butter-fat over last year's figures.

The average production of all cows completing test since 1934 is shown in Table 1.

Table 1.

AVERAGE PRODUCTION—PURE-BRED HERDS.

Year.	No. of Cows Completing Test.	Average Butter-Fat per Cow.
		lb.
1934–35	305	320·26
1935–36	367	297·17
1936–37	319	300·87
1937–38	333	298·08
1938–39	375	292·40
1939–40	382	305·88
1940–41	372	298·38
1941–42	290	322·84
1942–43	294	321·27
1943–44	289	311·57
1944–45	344	289·42
1945–46	393	279·93
1946–47	460	298·53

The percentage of cows passing standard is shown in Table 2, from which it will be seen that over all breeds an increase of 8.3% took place, whilst the Jerseys showed a slight improvement, the Guernseys 9.3% and the Australian Illawarra Shorthorns 13% better than last year.

In view of the fact that only 52.1% of all cows tested reached standard production, there is still ample room for improvement.

TABLE 2.

PERCENTAGE OF COWS PASSING STANDARD.

Year.	Australian Illawarra Shorthorn.	Guernsey.	Jersey.	Total.
	%	%	%	%
1937–38	59·1	68·7	35·6	53·1
1938–39	53·8	71·4	55·2	57·9
1939–40	48·0	77·5	64·2	59·2
1940–41	52·0	61·0	51·0	54·0
1941–42	73·0	68·3	59·7	68·3
1942–43	67·6	67·9	55·0	64·3
1943–44	57·8	52·1	73·3	61·9
1944–45	52·5	43·4	72·2	57·3
1945–46	43·1	33·3	52·0	43·8
1946–47	56·1	42·6	53·6	52·1

The number of cows passing standard and the proportion in each age group for each breed is given in Table 3.

This table shows that the Junior 2-year-olds again put up a creditable performance, approximately 78% of them exceeding standard. The Mature and Junior 4-year-olds were disappointing.

TABLE 3.

COWS PASSING STANDARD.

Age Class.	A.I.S.		Guernsey.		Jersey.		All Breeds.	
	No. of Cows Tested.	No. Passing Standard.	No. of Cows Tested.	No. Passing Standard.	No. of Cows Tested.	No. Passing Standard.	No. of Cows Tested.	No. Passing Standard.
Mature	54	20	44	8	41	11	139	39
Senior 4 years	15	6	4	3	10	8	29	17
Junior 4 years	18	5	8	....	11	5	37	10
Senior 3 years	20	10	9	7	11	7	40	24
Junior 3 years	28	20	15	9	11	7	54	36
Senior 2 years	29	15	12	7	11	7	52	29
Junior 2 years	62	51	16	12	31	22	109	85
Total	226	127	108	46	126	67	460	240
Percentage		56·1		42·6		53·6		52·1

Table 4 has been compiled this year to include the average milk production and percentage test as well as average butter-fat production. It will be seen that for all breeds, the only age groups which failed to reach standard were the Mature and Junior 4-year-olds.

In the Senior 4-year-old class the Jerseys did exceptionally well, ten averaging 7,741 lbs. milk with an average test of 5.44%, equal to 421.34 lbs. butter-fat.

In the Senior 3-year-old class, nine Guernseys averaged 7,096 lbs. of milk with an average test of 5.18%, equal to 368.12 lb. butter-fat.

The 62 Junior 2-year-olds, Australian Illawarra Shorthorn breed, averaged 6,770 lbs. milk, average test 4.13% with 280.10 lbs. butter-fat, compared with an average of 259.76 lbs. of butter-fat the previous year.

TABLE 4.

AVERAGE PRODUCTION IN EACH AGE CLASS—1946-47.

AGE CLASS.	A. I. S.					GUERNSEY				JERSEY				ALL BREEDS.			
	B/Fat Standard Required Lbs.	No. of Cows.	Average Milk Lbs.	% Test.	Average B/Fat Lbs.	No. of Cows.	Average Milk Lbs.	% Test.	Average B/Fat Lbs.	No. of Cows.	Average Milk Lbs.	% Test.	Average B/Fat Lbs.	No. of Cows.	Average Milk Lbs.	% Test.	Average B/Fat. Lbs.
Mature	350	54	8,281	3·98	329·84	44	5,815	4·96	289·03	41	6,336	4·99	316·68	139	6,927	4·51	313·04
Senior 4 years	330	15	6,884	4·27	294·09	4	6,818	5·33	363·75	10	7,741	5·44	421·34	29	7,171	4·84	347·58
Junior 4 years	310	18	6,927	3·98	276·09	8	5,107	4·92	251·48	11	6,418	5·25	336·99	37	6,382	4·52	288·87
Senior 3 years	290	20	7,461	4·02	299·89	9	7,096	5·18	368·12	11	6,255	5·28	330·32	40	7,047	4·59	323·61
Junior 3 years	270	28	6,695	4·21	231·99	15	5,917	4·91	291·00	11	5,416	5·59	302·78	54	6,219	4·64	288·73
Senior 2 years	250	29	6,770	4·09	276·95	12	5,196	5·17	269·01	11	5,736	5·35	306·97	52	6,188	4·54	281·45
Junior 2 years	230	62	6,770	4·13	280·10	16	5,395	4·87	263·04	31	5,090	5·25	267·71	109	6,094	4·49	274·07
Totals	....	226	7,205	4·08	294·17	108	5,791	5·0	289·80	126	6,008	5·22	313·84	460	6,545	4·56	298·53

Table 5 shows a comparison between the production of all cows under test 150 days and over, with those which completed 273 days. Information is given according to breed and age class.

TABLE 5.

COMPARATIVE TABLE SHOWING AVERAGE PRODUCTION IN EACH AGE CLASS OF COWS UNDER TEST 150 DAYS OR OVER AND COWS COMPLETING 273 DAYS.

Age Class.	Standard Butter Fat.	A.I.S. No. of Cows Tested 150 days or over.	A.I.S. Average Butter Fat.	A.I.S. No. of Cows Completing 273 days.	A.I.S. Average Butter Fat.	Jersey. No. of Cows Tested 150 days or over.	Jersey. Average Butter Fat.	Jersey. No. of Cows Completing 273 days.	Jersey. Average Butter Fat.
	lbs.		lbs.		lbs.		lbs.		lbs.
Mature	350	54	329·84	40	361·88	41	316·68	27	345·96
Senior 4 years	330	15	294·09	11	325·87	10	421·34	10	421·34
Junior 4 years	310	18	276·09	12	301·41	11	336·99	7	380·34
Senior 3 years	290	28	299·89	15	328·44	11	330·32	11	330·32
Junior 3 years	270	28	231·99	17	302·80	11	302·78	9	318·54
Senior 2 years	250	29	276·95	24	297·20	11	306·97	10	303·77
Junior 2 years	230	62	280·10	58	285·80	31	267·71	29	271·66

Age Class.	Standard Butter Fat.	Guernsey. No. of Cows Tested 150 days or over.	Guernsey. Average Butter Fat.	Guernsey. No. of Cows Completing 273 days.	Guernsey. Average Butter Fat.	All Breeds. No. of Cows Tested 150 days or over.	All Breeds. Average Butter Fat.	All Breeds. No. of Cows Completing 273 days.	All Breeds. Average Butter Fat.
	lbs.		lbs.		lbs.		lbs.		lbs.
Mature	350	44	289·03	33	311·89	139	313·04	100	341·09
Senior 4 years	330	4	363·75	4	363·75	29	347·58	25	370·12
Junior 4 years	310	8	251·48	4	268·15	37	288·87	23	319·65
Senior 3 years	290	9	368·12	9	368·12	40	323·61	35	339·24
Junior 3 years	270	15	291·00	14	289·73	54	288·73	40	301·77
Senior 2 years	250	12	269·01	9	291·33	52	281·45	43	297·50
Junior 2 years	230	16	263·04	14	276·84	109	274·07	101	280·49

In one or two cases the 273 day average is lower than that of cows tested 150 days or over; this is owing to the fact that in some instances cows tested less than 273 days still gave a high production.

In the Mature class the only breed to exceed standard in the 273 day average was the Australian Illawarra Shorthorn, while the Jersey breed exceeded standard in all other classes.

Of the 460 cows in the averages, 80% completed 273 days, compared with 72% the previous year.

Leading Sires.

The three leading sires for the year were "Mornmoot Northwood Beau," owned by R. H. Rose & Son, "Wooroloo Red Baron," owned by Wooroloo Sanatorium Farm and "Tipperary Ace," owned by W. G. Burges.

The adjusted average production of the six best daughters in each case was 548.51 lbs., 447.21 lbs. and 431.15 lbs. of butter-fat respectively.

Details of the averages of the six best and all daughters are given in Table 6.

TABLE 6.

LEADING THREE SIRES.—1946–47.

Name of Bull.	Owner.	Sire.	Dam.	Average Production of six best daughters.		Number of daughters under test.	Average Production.	
				Without allowances (lbs. butter fat).	With allowances (lbs. butter fat).		Without allowances (lbs. butter fat).	With allowances (lbs. butter fat).
Mornmoot Northwood Beau (Jersey) (17798)	R. H. Rose & Son	Glen Iris Golden Beau (14629)	Mornmoot Northwood Madeira 7th (63202)	506·26	548·51	17	416·39	480·49
Wooroloo Red Baron (A.I.S.) (6412)	Wooroloo Sanatorium Farm	Parkview Guardian (2557)	Wooroloo Bloomer (5218)	363·42	447·21	12	340·49	420·59
Tipperary Ace (A.I.S.) (6336)	W. G. Burges ...	Blacklands Monarch's Commander (1877)	Yallah Farm Maggie 2nd (1272)	388·78	431·15	15	307·86	362·90

TABLE 7. — AVERAGE PRODUCTION OF DAUGHTERS OF TEN SIRES, YEARS 1943–44 TO 1946–47.

Name of Bull.	Breed.	Sire.	Dam.	Average Production of six best daughters.		Number of daughters under test.	Average Production.	
				Without allowances (lbs. butter fat).	With allowances (lbs. butter fat).		Without allowances (lbs. butter fat).	With allowances (lbs. butter fat).
Mornmoot Northwood Beau (17798)	Jersey ...	Glen Iris Golden Beau (14629)	Mornmoot Northwood Madeira 7th (63202)	517·26	614·75	36	404·22	484·26
Austral Park Wonderful Standard (12423)	Jersey ...	Ellerdale Wonderful Masterman (11561)	Ellerdale Wonder's Golden (47992)	569·88	619·32	18	434·40	475·76
Grassvale Gold Boy (14684)	Jersey ...	Belgonia Gold Boy (12458)	Grassvale Lady Fowler 17th (48536)	481·47	540·67	23	416·40	459·73
Greenmount Golden Sultan (14688)	Jersey ...	Bellefaire Bonaparte's Bonetienne (9224)	Charming Lass of Greenmount (20903)	551·27	603·87	19	390·80	425·56
Koojan Beau Ideal (4965)	Guernsey ...	Glenburnie Ideal (Imp.) U.S.A. (2548)	Koojan Ace's Mignonette (3898)	475·04	536·76	17	353·37	414·69
Summerlea Churchill (6236)	A.I.S. ...	Summerlea Togo (1527)	Summerlea Empress 7th (14247)	341·33	428·90	18	306·45	384·42
Wooroloo Red Baron (6412)	A.I.S. ...	Parkview Guardian (2557)	Wooroloo Bloomer (5218)	354·61	458·92	22	307·41	383·71
Rosecliffe Marchalong (15094)	Jersey ...	Rosecliffe Flower's Bravo (12121)	Rosecliffe Viola (35771)	493·99	527·07	17	336·25	376·54
Homestead Ace (Imp.) U.S.A. (1631)	Guernsey ...	Archer of Cloture (Imp.) (133, 486)	Laddie's Blossom (118, 788)	398·13	486·01	16	320·72	373·02
Tipperary Ace (6336)	A.I.S. ...	Blacklands Monarch's Commander (1877)	Yallah Farm Maggie 2nd (1272)	393·95	441·61	26	293·04	357·75

TABLE 8.

THREE LEADING COWS IN EACH AGE CLASS.—1946-47.

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date entered Test.	No. of Days under Test.	Milk on Last Day of Test.	Total Milk for Period.	Average Test.	Total Butter Fat for Period.	Owner.	Sire.
MATURE COWS—STANDARD 350 LB. BUTTER FAT.						lb.	lb.				
Glanavon Rosina	A.I.S.	30603	3-5-37	5-9-46	273	40	13,410	4·82	647·54	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Koojan Golden Jewel	Guernsey	8805	12-3-40	21-12-45	273	21	9,963	5·58	556·34	A. W. Padbury	Koojan Beau Ideal (4965)
Congelin Iolanthe 8th	Jersey	80828	22-4-40	21-6-46	273	28·5	10,810	4·93	533·96	D. Bradford	Rosecliffe Marchalong (15094)
SENIOR FOUR YEAR OLDS—STANDARD 330 LB. BUTTER FAT.											
Grass Vale Buttercup 9th	Jersey	92713	24-5-41	7-5-46	273	24	9,852	6·02	593·91	R. H. Rose & Son	Grass Vale Gold Boy (14684)
Grass Vale Northwood Nora	do.	86646	23-5-41	31-3-46	273	19	8,172	6·27	512·79	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Grass Vale Lady Fowler 33rd	do.	92716	7-7-41	5-6-46	273	21	9,168	5·55	509·23	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
JUNIOR FOUR YEAR OLDS—STANDARD 310 LB. BUTTER FAT.											
Grass Vale Northwood Eve	Jersey	92725	3-7-42	25-9-46	273	20	10,035	5·74	576·16	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Grass Vale Norawood	do.	92724	27-6-42	9-8-46	273	18	7,674	5·40	414·42	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Radyr Park Dorothy 19th	do.	95267	16-3-42	16-9-46	273	20	8,550	4·79	409·68	L. M. Temple	Navua Coronation Star (14929)
SENIOR THREE YEAR OLDS—STANDARD 290 LB. BUTTER FAT.											
Koojan Noblemark's Bo-peep	Guernsey	....	19-12-42	6-10-46	273	29	10,557	5·46	577·07	A. W. Padbury	Koojan Ideal's Noblemark (5949)
Grass Vale Silvermine 2nd	Jersey	....	8-9-42	21-4-46	273	23	9,129	5·64	515·57	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Koojan Ace's Dianthus	Guernsey	10687	29-6-42	29-4-46	273	22	8,106	5·66	459·49	A. W. Padbury	Homestead Ace (Imp.) (1631)
JUNIOR THREE YEAR OLDS—STANDARD 270 LB. BUTTER FAT.											
Grass Vale Golden Cream 26th	Jersey	98525	3 8-43	8-10-46	273	20·5	7,561	5·87	444·51	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Valliere Emma	A.I.S.	....	25-3-43	29-6 46	210	24	10,920	3·46	378·72	C. P. House	Wooroloo Noble 4th (6411)
Mayvale Golden Buttercup 2nd	Guernsey	10869	14-7 42	12-1-46	273	18	7,164	5·22	374·57	R. J. Giles	Koojan Ideal's Discoverer (4968)
SENIOR TWO YEAR OLDS—STANDARD 250 LB. BUTTER FAT.											
Capel Dairymaid 6th	A.I.S.	....	18 6-43	1-6-46	273	37	12,936	3·80	492·36	B. W. Prowse	Capel Star King (4672)
Tipperary Dove 23rd	do.	....	7-4-43	2-3-46	273	36	10,968	4·03	442·38	W. G. Burges	Tipperary Ace (6336)
Grass Vale Magnolia 5th	Jersey	98526	16-10-43	2-9-46	273	21	8,088	5·38	435·33	R. H. Rose & Son	Grass Vale Gold Cup (20745)
JUNIOR TWO YEAR OLDS—STANDARD 230 LB. BUTTER FAT.											
Valliere Nina	A.I.S.	....	15-5-44	4-8-46	273	22	10,611	4·34	460·64	C. P. House	Wooroloo Noble 4th (6411)
Capel Blue Pansy	do.	....	15-5-44	25-7-46	273	24·5	10,498	4·10	430·41	B. W. Prowse	Capel Star King (4672)
Grass Vale Eve	Jersey	....	19-9-43	25-2-46	273	23·5	6,955	6·04	420·29	R. H. Rose & Son	Mornmoot Northwood Beau (17798)

Table 7 shows the performances of ten sires from 1943-44 to 1946-47. In each case the average productions of the six best and all daughters for the period is given.

The productions of the leading three cows in each age class are shown in Table 8.

Of the 21 cows whose productions are given in this table, it will be seen that one was over 600 lbs. butter-fat, 8 were over 500 lbs. butter-fat, ten were over 400 lbs. butter-fat, eleven of the twenty-one are Jerseys, six Australian Illawarra Shorthorns, and four Guernseys.

NEW RECORDS.

Two new records were established during the year:—

Junior 3-year-old Class—Guernseys.

"Koojan Noblemark's Bo-peep," owned by A. W. Padbury, produced 10,557 lbs. milk, average test 5.46% and 577.07 lbs. of butter-fat, thus exceeding the previous record of another cow of the same owner, viz., "Koojan Bo-peep 2nd," who in 1941 produced 9,639 lbs. milk, average test 5.69% and 548.93 lbs. of butter-fat.

The new record holder is by "Koojan Ideal's Noblemark" from "Koojan Ace's Barbara," the latter being out of "Koojan Bo-peep 2nd," the previous holder of this record.

The sire, "Koojan Ideal's Noblemark," is from "Koojan Ace's Jewel 2nd," the property of the same owner, and the holder of the following State records in the Mature Class:—Guernsey breed; West Australian-bred; and All Breeds. She produced 14,540 lbs. milk, average test 5.51% and 801.16 lbs. butter-fat.

Junior 2-year-old Class—Australian Illawarra Shorthorn.

"Valliere Nina," owned by C. P. House, of Ludlow, produced 10,611 lbs. milk, average test 4.34%, 460.64 lbs. butter-fat, exceeding the previous record held by "Glanavon Doris 7th," whose figures were 11,796 lbs. milk, average test 3.83% and 451.49 lbs. butter-fat.

"Valliere Nina" is by "Wooroloo Noble 4th" out of "Valliere Fairy 2nd."

The productions of all cows completing test during the year are shown in Table 9.

TABLE 9.

COWS WHICH COMPLETED TEST DURING THE TWELVE MONTHS ENDED 30TH JUNE, 1947.

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS UNDER 2½ YEARS—STANDARD 230 LB. BUTTER FAT.											
Valliere Nina	A.I.S.	....	15-5-44	4-8-46	273	22	10,611	4·34	460·64	C. P. House	Wooroloo Noble 4th (6411)
Capel Blue Pansy	do.	....	15-5-44	25-7-46	273	24·5	10,498	4·10	430·41	B. W. Prowse	Capel Star King (4672)
Grass Vale Eve	Jersey	....	19-9-43	25-2-46	273	23·5	6,955	6·04	420·29	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Wooroloo Trinket	A.I.S.	....	30-3-44	2-8-46	273	23	9,159	4·42	404·95	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Tipperary Beauty 21st	do.	....	1-10-44	12-9-46	273	30	8,730	4·27	373·52	M. H. Montgomery	Liberton Venturer 2nd. (7132)
Wooroloo Lorna	do.	....	6-4-44	2-10-46	273	29	8,397	4·44	372·84	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Juadine Julienne 4th	Jersey	....	28-5-44	23-8-46	273	13·5	6,055	5·91	357·96	K. V. Gray	Juadine Northwood Beau (19670)
Capel Fairy's Fleck	A.I.S.	....	26-5-44	30-9-46	273	27·5	8,362	4·23	354·31	B. W. Prowse	Capel Dove King (5579)
Valliere Dairymaid	do.	....	8-4-44	13-4-46	273	29	9,222	3·81	352·65	J. Bensted & Co.	Valliere Skipton (7595)
Wooroloo Bertha	do.	....	26-7-44	25-9-46	273	21	8,193	4·21	345·72	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Wooroloo Rae	do.	....	9-5-44	26-7-46	273	22	8,121	4·24	344·43	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Claremont Clara 23rd	do.	....	22-6-44	1-9-46	273	29	8,667	3·96	344·05	Claremont Hospital for Insane	Glanavon Dunster (6867)
Muresk Dignity	Guernsey	....	17-9-44	9-8-46	273	24	7,332	4·64	340·46	Muresk Agricultural College	Koojan Ideal's Dictator (4167)
Tipperary Beauty 20th	A.I.S.	....	3-8-44	10-9-46	273	22	7,326	4·57	335·28	M. H. Montgomery	Liberton Venturer 2nd (7132)
Juadine Queen 2nd	Jersey	....	2-1-44	25-5-46	273	14	5,442	6·15	334·94	K. V. Gray	Juadine Northwood Beau (19670)
Wooroloo Red Gum 2nd	A.I.S.	....	5-5-44	14-8-46	273	23	7,629	4·38	334·39	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Warraiyn Marie 11th	Jersey	....	3-4-44	21-6-46	273	15·5	5,776	5·77	333·40	M. B. Stott	Juadine Sparkle's Wonder (18659)
Grass Vale Silvermine 4th	do.	....	29-9-44	16-10-46	273	14·5	6,208	5·35	332·33	R. H. Rose & Son	Mornmoot Northwod Beau (17798)
Muresk Jessica	Guernsey	....	26-7-44	7-10-46	273	21	6,753	4·81	325·44	Muresk Agricultural College	Koojan Ideal's Dictator (4167)
Wooroloo Lady May 6th	A.I.S.	....	23-5-44	12-8-46	273	19	7,317	4·44	325·32	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Muresk Awas	Guernsey	....	25-5-44	31-5-46	273	17	6,951	4·67	324·66	Muresk Agricultural College	Koojan Ideal's Dictator (4167)
Grass Vale Lady Fowler 39th	Jersey	....	30-9-43	2-11-45	273	21	6,093	5·30	323·47	R. H. Rose & Son ...	Mornmoot Northwood Beau (17798)
Claremont Mabel 31st	A.I.S.	....	3-1-44	11-6-46	273	27	7,551	4·22	318·99	Claremont Hospital for Insane	Summerlea Churchill (6238)
Claremont Treasure 40th	do.	....	11-1-44	6-7-46	273	27	7,911	4·03	318·85	Claremont Hospital for Insane	Westby Masterpiece (5403)
Grass Vale Magnolia 6th	Jersey	....	3-4-44	25-8-46	273	14	5,862	5·42	317·82	R. H. Rose & Son ...	Mornmoot Northwood Beau (17798)
Claremont Cocky 30th	A.I.S.	....	5-1-44	24-2-46	273	27	7,641	4·14	316·82	Claremont Hospital for Insane	Westby Monarch (5404)

Kapara Sparkle 4th	Jersey	....	15-4-44	22-6-46	273	14·5	6,733	4·67	314·91	D. Bradford	Congelin Jolly Eminent 3rd (18425)
Mayville Discoverer's Daffodil	Guernsey	....	20-1-44	20-6-46	273	17	5,211	6·00	313·04	R. J. Giles	Koojan Ideal's Discoverer (4968)
Juadine Peerless Lily 23rd	Jersey	....	27-4-44	6-8-46	273	17	6,066	5·11	310·57	M. B. Stott	Juadine Northwood Beau (19670)
Carbanup Grace	A.I.S.	....	12-2-44	16-6-46	273	17·5	7,183	4·32	310·26	D. H. Bell	Glanavon Maestro (4833)
Claremont Pinafore 18th	do.	....	30-9-43	4-11-45	273	26	7,278	4·25	309·36	Claremont Hospital for Insane	Glanavon Dunster (6867)
Claremont Cocky 27th	do.	....	25-12-43	20-6-46	273	24	7,332	4·21	308·89	Claremont Hospital for Insane	Westby Monarch (5404)
Grass Vale Silvermine 3rd	Jersey	....	15-10-43	27-11-45	273	9	5,217	5·82	303·88	R. H. Rose & Son ...	Mornmoot Northwood Beau (17798)
Claremont Treasure 43rd	A.I.S.	....	27-1-44	29-6-46	273	22	7,251	4·17	302·67	Claremont Hospital for Insane	Westby Monarch (5404)
Claremont Whitby Maid 58th	do.	....	2-1-44	1-5-46	273	25	7,425	4·06	301·74	Claremont Hospital for Insane	Westby Masterpiece (5403)
Claremont Star 33rd	do.	....	15-11-43	15-1-46	273	24	7,662	3·93	301·34	Claremont Hospital for Insane	Summerlea Churchill (6236)
Tipperary Dove 27th	do.	....	10-6-43	11-11-45	273	25	7,095	4·24	301·02	W. G. Burges	Tipperary Ace (6336)
Kapara Rosebud 2nd	Jersey	....	28-5-44	12-6-46	273	11·5	5,269	5·67	299·24	D. Bradford	Congelin Jolly Eminent 3rd (18425)
Mayvale Ideal's Daisy	Guernsey	....	29-7-44	23-9-46	273	16	5,838	5·11	298·80	R. J. Giles	Koojan Ideal's Discoverer (4968)
Claremont Poppy 35th	A.I.S.	....	10-4-44	29-7-46	273	25	7,200	4·13	297·77	Claremont Hospital for Insane	Glanavon Dunster (6867)
Claremont Star 34th	do.	....	4-1-44	24-2-46	273	25	7,215	4·09	295·35	Claremont Hospital for Insane	Summerlea Churchill (6236)
Brookfields Cremorne	Guernsey	....	17-7-43	9-11-45	273	13·5	5,215	5·65	294·70	P. G. Hampshire & Son	Yarraview Julian (4634)
Claremont Mabel 29th	A.I.S.	....	9-10-43	30-1-46	273	25	7,305	4·00	292·77	Claremont Hospital for Insane	Westby Monarch (5404)
Tipperary Pretty Maid 3rd	do.	....	7-10-43	21-11-45	273	25	6,915	4·22	292·38	W. G. Burges	Tipperary Ace (6336)
Grassvale Lady Fowler 42nd	Jersey	....	27-8-44	25-8-46	273	12	5,361	5·40	289·79	K. V. Gray	Mornmoot Northwood Beau (17798)
Wooroloo Ethel 2nd	A.I.S.	....	27-7-44	4-9-46	273	5	6,600	4·31	284·48	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Kapara Sparkle's Lassie 3rd	Jersey	....	13-8-44	21-6-46	273	14	5,937	4·78	284·34	D. Bradford	Congelin Jolly Eminent 3rd (18425)
Lenmoor's Biddy 2nd	A.I.S.	....	7-7-44	6-7-46	273	12	7,131	3·92	280·14	G. W. Marston	Wooroloo Union Jack (7662)
Kapara Firefly 2nd	Jersey	....	5-8-44	21-6-46	273	15	5,970	5·65	277·78	D. Bradford	Congelin Mandarin (14542)
Yokanup Lupin 3rd	A.I.S.	....	27-5-44	28-7-46	273	14	7,482	3·65	273·41	Burkitt & Brown ..	Parkview Commodore (306)
Muresk Joan	Guernsey	....	10-6-44	13-7-46	273	17	6,291	4·31	271·74	Muresk Agricultural College	Koojan Ideal's Dictator (4167)
Claremont Treasure 42nd	A.I.S.	....	27-1-44	25-6-46	273	20	6,540	4·15	271·48	Claremont Hospital for Insane	Westby Monarch (5404)
Denmark Ruler's Rose	Guernsey	....	5-1-44	4-5-46	273	19	6,207	4·34	269·89	Denmark Research Station	Denmark Marie's Ruler (5756)
Kapara Dairymaid 2nd ...	Jersey	....	14-5-44	10-9-46	273	19·5	6,060	4·42	268·38	D. Bradford	Congelin Jolly Eminent 3rd (82073)
Tipperary Beauty 19th	A.I.S.	....	4-11-43	19-11-45	273	20	6,420	4·17	267·86	W. G. Burges	Tipperary Ace (6336)
Tipperary Fairy 10th	do.	....	26-10-43	7-11-45	273	24	6,702	3·99	267·81	W. G. Burges	Tipperary Ace (6336)
Claremont Belle 40th	do.	....	10-3-44	1-8-46	273	21	6,723	3·97	267·52	Claremont Hospital for Insane	Westby Masterpiece (5403)
Claremont Maggie Morrison 61st	do.	....	9-1-44	21-6-46	273	23	6,600	4·05	267·38	Claremont Hospital for Insane	Westby Monarch (5404)
Claremont Poppy 34th	do.	....	22-2-44	12-6-46	273	16	5,928	4·50	266·96	Claremont Hospital for Insane	Summerlea Churchill (6238)
Claremont Cleggett 27th	do.	....	5-9-43	7-11-45	273	20	6,420	4·14	266·27	Claremont Hospital for Insane	Westby Masterpiece (5403)
Claremont Cherry 36th	do.	....	1-11-43	17-12-45	273	17	6,231	4·26	265·73	Claremont Hospital for Insane	Glanavon Dunster (6867)
Muresk Diadem	Guernsey	....	7-5-44	20-11-45	273	16	4,908	5·40	265·42	Muresk Agricultural College	Koojan Ace's Warspite (5943)

TABLE 9—HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS UNDER 2½ YEARS—STANDARD 230 LB. BUTTER FAT—*continued.*											
Claremont Cherry 35th	A.I.S.	....	20-9-43	15-10-45	273	21	5,943	4·40	261·77	Claremont Hospital for Insane	Glanavon Dunster (6867)
Radyr Park Dorothy 29th	Jersey	....	12-7-44	26-8-46	273	11	4,848	5·36	260·32	L. M. Temple	Radyr Park Estrellita 2nd Star bright (21187)
Claremont Cocky 31st	A.I.S.	....	11-1-44	14-6 46	273	19	6,057	4·27	258·84	Claremont Hospital for Insane	Westby Monarch (5404)
Eungella Yileen	Jersey	....	27-4-44	2-5-46	273	12·5	5,632	4·59	258·63	D. G. Spark	Eungella Prince Starlight (19538)
Lenmoor's Peggy 2nd	A.I.S.	....	15-1-44	1-5-46	273	15	7,275	3·53	257·42	G. W. Marston	Ferndale Radiant (5729)
Claremont Maggie Morrison 55th	do.	....	18-8-43	6-10-45	273	26	6,588	3·88	256·08	Claremont Hospital for Insane	Westby Masterpicce (5403)
Wooroloo Delys	do.	...	1-4-44	30-5-46	273	13	5,709	4·47	255·56	Wocroloo Sanatorium Farm	Wooroloo Top Gallant (7661)
Denmark Daffodil	Guernsey	....	21-4-44	30-5-46	273	14	4,707	5·35	251·86	Denmark Research Station	Koojan Ideal's Reflection (4974)
Denmark Bonnie Marie	do.	....	30-11-43	8-5-46	273	15	5,745	4·34	249·57	Denmark Research Station	Denmark Marie's Ruler (5756)
Claremont Clarie 3rd	A.I.S.	....	9-11-43	3-5-46	273	20	6,030	4·13	249·55	Claremont Hospital for Insane	Glanavon Dunster (6867)
Kapara Duchess 2nd	Jersey	....	18-6-44	9-6-46	273	12·5	5,332	4·67	249·13	D. Bradford	Congelin Jolly Eminent 3rd (18425)
Kapara Valentine	do.	....	13-3-44	20-6-46	273	13	5,289	4·60	243·69	D. Bradford	Kapara Cream Socks (20860)
Radyr Park Dorothy 27th	do.	....	19-6-44	26-8-46	273	10	4,605	5·28	243·49	L. M. Temple	Radyr Park Estrellita 2nd Star light (21187)
Kapara Dairymaid 3rd	do.	....	4-8-44	24-6-46	273	11	4,818	5·03	242·73	D. Bradford	Congelin Mandarin (14542)
Wooroloo Bella 3rd	A.I.S.	.. .	23-9-43	3 10-45	273	16	5,613	4·27	241·08	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Radyr Park Dorothy 31st	Jersey	....	7-12-44	3-9-46	240	13	4,905	4·84	237·72	L. M. Temple	Radyr Park Estrellita 2nd Star light (21187)
Wattle Creek Valetta	A.I.S.	....	16-6-43	6 10-45	273	18	7,284	3·26	237·64	E. T. Thatcher	Wooroloo Royal Standard (6414)
Scotch College Flora McDonald	do.	....	4-6-44	21-7-46	210	21·5	6,210	3·80	236·40	J. Bensted & Co.	Claremont Signet (5590)
Rutherwood Golden Butterfly	Guernsey	....	22-1-44	16-5-46	273	13·5	4,510	5·21	235·39	Misses E. & I. Rutherford	Denmark Golden Rippler (5751)
Montaro Kitty	A.I.S.	....	19-9-44	14-9-46	273	8	4,704	4·96	233·71	M. H. Montgomery	Glanavon Tudor
Carbunup Gold	do.	....	1-3-44	21-8 46	240	2	5,805	4·02	233·49	D. H. Bell	Newstead Royal Sun (7252)
Tipperary Dove 28th	do.	....	1-8-43	25 11-45	273	6	5,778	4·01	232·81	W. G. Burges	Tipperary Ace (6336)
Tipperary Beauty 18th	do.	....	8-10-43	29-10-45	273	16	5,658	4·11	232·55	W. G. Burges	Tipperary Ace (6336)
Valliere Winnie	do.	....	10-4 44	31-3-46	273	19	5,397	4·24	229·14	J. Bensted & Co.	Valliere Skipton (7595)
Kapara Bo-Peep 2nd	Jersey	....	17-5-44	19-6-46	273	8	3,954	5·77	228·15	D. Bradford	Congelin Jolly Eminent 3rd (18425)
Korijekup Nadine	do.	....	23-11-43	19-2-46	273	14	4,362	5-21	227·48	Mrs. A. G. Eckersley	Juadine Captain
Carbunup Gem	A.I.S.	....	19-6-44	31-8 46	273	8	5,439	4·18	227·39	D. H. Bell	Newstead Royal Sun (7252)
Clovelly Olive	Guernsey	....	30-6-44	12-6-46	273	8	4,059	5·49	222·58	Mrs. L. R. Barnsby....	Denmark Rosa's Ace (5760)
Wattle Creek Glamour	A.I.S.	....	21-8-43	8-10-45	273	13	5,169	4·27	221·10	E. T. Thatcher	Wooroloo Royal Standard (6414)

Claremont Biddy 76th	A.I.S.	....	26-3-44	30-6-46	273	19	5,487	3·96	217·20	Claremont Hospital for Insane	Glanavon Dunster (6867)
Kapara Sparkle's Victorious 2nd	Jersey	....	29-5-44	21-6-46	273	8·5	4,135	5·13	212·26	D. Bradford	Congelin Jolly Eminent 3rd (18425)
Rutherwood Golden Dawn....	Guernsey	....	15-4 44	16-5-46	273	12·5	4,507	4·70	212·26	Misses E. & I. Rutherford	Denmark Golden Rippler (5751)
Claremont Pinafore 19th	A.I.S.	....	3-1-44	3 4 46	273	19	5,817	3·63	211·60	Claremont Hospital for Insane	Westby Monarch (5404)
Colliedale Lass	Jersey	....	12-6-44	10-5-46	273	9	4,347	4·78	207·85	C. E. Kruger	Belgonia Peggy 6th's Aim (17263)
Camden Cleopatra 2nd	do.	....	20-8-44	26-4 46	273	9	3,387	5·97	202·08	C. E. Kruger	Greenmount Starbright (20748)
Wooroloo Sally	A.I.S.	....	10-3-44	2 6-46	273	4	4,347	4·59	199·79	Wooroloo Sanatorium Farm	Wooroloo Top Gallant (7661)
Lenmoor's Queen 5th	do.	....	20-6-44	1 5-46	273	10	6,120	3·20	196·45	G. W. Marston	Woorlooo Union Jack (7662)
Rosella Daffodil	Guernsey	....	7-8-44	12-8 46	180	14·5	3,540	5·26	186·21	Darnell Brothers	Cranbourne Charlie (3993)
Colliedale Biddy	Jersey	....	20 6-44	21-2-46	273	14	3,702	5·01	185·68	C. E. Kruger ..	Belgonia Peggy 6th's Aim (17263)
Camden Belle 2nd	do.	....	17-4-43	21-10-45	240	7	3,405	5·37	183·09	C. E. Kruger	Camden Rajah (19423)
Camden Venus 2nd	do.	....	20-4-44	13-5-46	273	5	3,255	5·48	178·64	C. E. Kruger	Greenmount Starbright (20748)
Camden Sheba	do.	....	5-2-45	28-7-46	273	4	2,817	5·99	168·96	C. E. Kruger	Greenmount Starbright (20748)
Scotch College Gentle Mary	A.I.S.	....	12 3-44	29-4-46	273	6	4,533	3·66	166·00	J. Bensted & Co.	Claremont Signet (5590)
Tipperary Peggy 3rd	do.	....	14-6 43	28-11-45	273	7	4,251	3·88	164·97	W. G. Burges	Tipperary Ace (6336)
Narrogin Diana	do.	....	13-11-43	13-4-46	180	6	3,165	5·11	161·94	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Wattle Creek Dixie	do.	....	12-2 44	20-11 45	240	12	3,840	4·11	158·10	E. T. Thatcher	Glanavon Duncan
Rosella Matilda	Guernsey	....	23-9 44	5-9 46	150	12·5	2,550	5·75	146·73	Darnell Brothers	Cranbourne Charlie (3993)
Rosella Gloria	do.	....	2-11-44	27-9 46	120	13	2,250	5·24	118·02	Darnell Brothers	Cranbourne Charlie (3993)
Rosella Wallflower	do.	....	9-9-44	3 10-46	120	15·5	2,520	4·56	114·93	Darnell Brothers	Cranbourne Charlie (3993)
Brookfields Betty 4th	do.	....	30-5-44	19-8-46	90	17	1,530	7·48	114·48	P. G. Hampshire & Son	Yarraview Julian (4634)
Rosalind Janet 9th	A.I.S.	....	23-10 44	14-9-46	120	16	2,160	4·29	92·70	W. K. Barnes	Wallatin Dandy (6370)
Korijekup Lady Star	Jersey	....	20 1 44	13 4-46	120	10	1,890	4·75	89·79	Mrs. A. G. Eckersley	Navua Royal Star (15869)
Walgett Handsome Girl 40th	do.	....	13-4 45	22-11 46	90	10	1,575	4·28	67·41	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Narrogin Dell	A.I.S.	....	17-4-44	30-5-46	150	8	1,380	4·29	59·22	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Brookfields Betty 2nd	Guernsey	....	4 3 44	26-8-46	60	14·5	915	5·01	45·87	P. G. Hampshire & Son	Yarraview Julian (43634)
Claremont Maggie Morrison 60th	A.I.S.	....	9-1-44	18-6-46	60	16	960	4·01	38·52	Claremont Hospital for Insane	Westby Monarch (5404)
Claremont Flora 14th	do.	....	1-3 44	13-6-46	30	19	570	3·63	20·70	Claremont Hospital for Insane	Glanavon Dunster (6867)

COWS 2½ YEARS AND UNDER 3 YEARS.—STANDARD 250 LB. BUTTER FAT.

Capel Dairymaid 6th	A.I.S.	....	18-6-43	1-6-46	273	37	12,936	3·80	492·36	B. W. Prowse	Capel Star King (4672)
Tipperary Dove 23rd	do.	....	7-4-43	2-3-46	273	36	10,968	4·03	442·38	W. G. Burges	Tipperary Ace (6336)
Grass Vale Magnolia 5th	Jersey	98526	16-10-43	2-9-46	273	21	8,088	5·38	435·33	R. H. Rose & Son	Grass Vale Gold Cup (20745)
Koojan Ace's Diplomat	Guernsey	....	28-8-43	26-8-46	273	19	7,467	5·50	411·14	A. W. Padbury	Homestead Ace (Imp.) (1631)
Grass Vale Design's Noella	Jersey	....	20-10 43	17-9-46	273	13·5	7,660	5·32	407·64	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Grass Vale Lady Fowler 39th	do.	....	30-9-43	22-9-46	273	19·5	7,468	5·26	393·21	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Carbunup Flirt	A.I.S.	....	23-6-43	3-3 46	273	26	8,238	4·67	385·84	D. H. Bell	Newstead Royal Sun (7252)
Eungella Faline	Jersey	98285	4-5 43	29-4-46	273	16·5	6,769	5·56	376·70	D. G. Spark	Travalgan Starbright King (18129)
Landsowne Virtue	Guernsey	....	30 4 43	2 4 46	273	18	6,669	5·47	365·18	J. R. Giles	Koojan Beau Ideal (4965)
Grantville Blossom 5th	A.I.S.	....	26-10-43	20 7-46	273	26	8,958	4·01	359·45	W. G. Burges	Swanlea Monarch 2nd (7514)
Greyleigh Precious Gem	do.	....	2-9-43	31 5 46	273	16	8,118	4·23	344·06	W. G. Burges	Swanlea Bertie (5290)
Grass Vale Buttercup 14th	Jersey	....	7-9-43	17-8-46	210	10	5,895	5·75	338·97	R. H. Rose & Son	Grass Vale Gold Cup (20745)
Wooroloo Vanity 2nd	A.I.S.	....	9 11-43	15-5-46	273	22	7,236	4·65	337·04	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Tipperary Dove 25th	do.	40635	6-5-43	14-11-45	273	33	7,989	4·15	331·55	W. G. Burges	Tipperary Ace (6336)

TABLE 9—HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS UNDER 2½ YEARS AND UNDER 3 YEARS—STANDARD 250 LB. BUTTERFAT.—*continued.*											
Carbunup Fay	A.I.S.	....	17 8-43	21-6 46	273	9·5	7,978	4·05	323·12	D. H. Bell	Newstead Royal Sun (7252)
Wooroloo Golden Dawn	do.	....	17 10-43	12-8-46	273	23	7,164	4·47	320·43	Wooroloo Sanatorium Farm	Berry, Rufus 2nd (6570)
Camden Celeste	Jersey	....	10 9-43	19 5 46	273	9	5,202	6·09	317·24	D. G. Spark	Greenmount Golden Bobbie (18578)
Tipperary Beauty 17th	A.I.S.	....	1-4 43	26 10-45	273	16	7,068	4·31	305·21	W. G. Burges	Tipperary Ace (6336)
Carbunup Fussy	do.	....	22-8-43	3-7-46	273	9·5	7,228	4·20	303·74	D. H. Bell	Glanavon Maestro (4833)
Muresk Gwenda	Guernsey	....	3 5-43	23-12-45	273	21	6,183	4·79	296·43	Muresk Agricultural College	Koojan Ideal's Dictator (4167)
Muresk Lady Bonnie	do.	....	19-9-43	29-3-46	273	19	5,517	5·34	294·89	Muresk Agricultural College	Koojan Ideal's Dictator (4167)
Wattle Creek Bluebell	A.I.S.	28485	29-10-43	21-9-46	273	20	6,360	4·58	291·40	E. T. Thatcher	Wooroloo Royal Standard (6414)
Carbunup Fancy	do.	....	15-3-43	28 2-46	273	21	7,308	3·85	281·54	D. H. Bell	Newstead Royal Sun (7252)
Tipperary Lady May 6th	do.	....	8-5-43	7 12-45	273	26	6,078	4·00	279·16	W. G. Burges	Tipperary Ace (6336)
Denmark Dawn's Reflectionette	Guernsey	....	7-9-43	12-5-46	273	15	5,150	5·38	277·51	Denmark Research Station	Koojan Ideal's Reflection (4974)
Clovelly Hazel	do.	....	14-8-43	10-7-46	273	9	5,307	5·13	272·28	Mrs. L. R. Barnsby....	Lansdowne Polydymite (4995)
Tirano Katoomba 2nd	A.I.S.	....	12-2-43	2-2-46	273	24	6,852	3·93	269·92	J. Bensted & Co.	Chittering Prince (3800)
Travalgan Starbright 22nd....	Jersey	....	18-6-43	13-6-46	273	11	4,908	5·48	269·43	K. V. Gray	Travalgan Oxford's King (19160)
Muresk Susannah	Guernsey	....	29-11-43	6 7 46	273	12	5,496	4·88	268·43	Muresk Agricultural College	Koojan Ideal's Dictator (4974)
Narrogin Charmer	A.I.S.	....	2-8-43	20-4-46	273	12	5,976	4·17	249·31	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Claremont Biddy 75th	do.	....	6-2-44	28-9-46	273	22	6,636	3·73	247·59	Claremont Hospital for Insane	Westby Masterpiece (5403)
Glanavon Fairy 8th	do.	....	24-3 43	19-10 45	273	12	5,406	4·46	238·20	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Camden Selena	Jersey	....	28-9-43	24-5-46	273	8	4,344	5·46	237·51	D. G. Spark	Greenmount Golden Bobbie (18578)
Narrogin Duchess	A.I.S.	....	23-1-44	29-10-46	273	17	5,856	3·93	230·67	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Yokanup Daphne 2nd	do.	....	10 10-43	9-7-46	273	11	5,913	3·84	227·38	Burkitt & Brown	Parkview Commodore (306)
Claremont Bell 39th	do.	....	26 1-44	11-8-46	273	17	5,871	3·86	226·98	Claremont Hospital for Insane	Westby Masterpiece (5403)
Wattle Creek Birdie	do.	....	21-9-43	19-7-46	273	7	5,361	4·21	225·92	E. T. Thatcher	Wooroloo Royal Standard (6414)
Clovelly Diamond	Guernsey	....	10-6-43	6-6-46	240	14	4,740	4·70	222·87	Mrs. L. R. Barnsby....	Lansdowne Polydymite (4995)
Rosella Bloom	do.	....	1-9-43	6-7-46	210	11·5	4,665	4·79	222·75	Darnell Brothers	Cranbourne Charlie (3993)
Denmark Ace's Briarette	do.	....	9-8-43	20 4-46	273	12·5	3,922	5·61	220·32	Denmark Research Station	Denmark Ace (5738)
Walgett Ranunculas	Jersey	....	26-5-43	20-3-46	273	8	4,824	4·51	217·74	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Narrogin Flo	A.I.S.	....	6-4-43	15-3-46	240	14	6,240	3·49	217·68	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Rosella Pauline	Guernsey	....	8-8-43	29-5-46	273	11	4,188	5·15	215·81	Darnell Brothers	Cranbourne Charlie (3993)
Horsford Society 4th	A.I.S.	....	17-1-44	8-8-46	180	13	5,340	3·99	213·09	W. K. Barnes	Wooroloo Red Lad (5418)
Tipperary Dove 22nd	do.	....	29-3-43	2-12-45	273	10	5,340	3·94	210·55	W. G. Burges	Tipperary Ace (6336)
Wattle Creek Phyllis	do.	....	13-5-43	21-12-45	273	16	4,908	4·26	209·15	E. T. Thatcher	Wooroloo Royal Standard (6414)

Walgett Proud Wyandotte....	Jersey	....	1–5–43	3 5–46	273	9·5	4,438	4·68	207·71	C. J. Cunningham	Selsey Wyandottes Prince (18058)
Narrogin Marion	A.I.S.	....	10–6–43	26–3–46	240	12	4,695	3·83	179·85	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Camden Milkmaid	Jersey	....	9–12–43	26–7–46	273	6	3,498	5·0	175·18	C. E. Kruger	Greenmount Starbright (20748)
Clovelly Glory	Guernsey	....	30 9–43	5–6–46	240	6·5	3,045	5·27	160·50	Mrs. L. R. Barnsby	Lansdowne Polydymite (4995)
Lenmoor's Rosy	A.I.S.	....	18–8–43	21–8–46	150	13	4,095	3·79	155·28	W. K. Barnes	Ferndale Radiant (5729)
Rosella Pearl	Guernsey	....	27 8–43	9–7–46	120	15	2,550	5·21	133·08	Darnell Brothers	Cranbourne Charlie (3993)
Narrogin Dora	A.I.S.	....	1–7 43	19 3 46	240	6	3,315	3·97	131·85	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Walgett Handsome Girl 37th	Jersey	...	18–4–44	6–12 46	120	15·5	2,355	4·67	110·04	C. J. Cunningham	Selsey Wyandottes Prince (18058)
Rosella Ladybird	Guernsey	....	29–11–43	2 10 46	120	8·5	2,325	4·47	104·13	Darnell Brothers ..	Cranbourne Charlie (3993)
Brookfields Juliette	do.	....	22–10–43	19–7–46	120	8·5	1,515	5·54	84·03	P. G. Hampshire & Son	Yarraview Julian (4634)
Narrogin Dorothea	A.I.S.	....	8–6 44	11 2 47	90	10	1,580	3·95	54·50	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Narrogin Clarice	do.	....	4–4 44	11–3 47	60	19	1,275	3·24	41·40	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Plenarbor Daffodil	do.	....	22–4–44	23–11–46	30	22·5	675	3·64	24·57	Mrs. V. Alexander	Glanavon Genius (3957)

COWS 3 YEARS AND UNDER 3½ YEARS.—STANDARD 270 LB. BUTTERFAT.

Grass Vale Golden Cream 26th	Jersey	98525	3–8–43	8–10–46	273	20·5	7,561	5·87	444·51	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Valliere Emma	A.I.S.	....	25 3–43	29–6–46	210	24	10,920	3·46	378·72	C. P. House	Wooroloo Noble 4th (6411)
Mayvale Golden Buttercup 2nd	Guernsey	10869	14 7 42	12 1 46	273	18	7,164	5·22	374·57	R. J. Giles	Koojan Ideal's Discoverer (4968)
Juadine Fairy	Jersey	....	12 6 43	2 7 46	273	5	5,835	6·33	369·62	K. V. Gray	Juadine Northwood Beau (19670)
Carbunup Floss	A.I.S.	....	22 4 43	3 7 46	240	1	8,325	4·36	363·12	D. H. Bell	Newstead Royal Sun (7252)
Tipperary Beauty 15th	do.	....	15–10 42	9 3 46	273	27	8,691	4·12	358·77	W. G. Burges	Tipperary Ace (6336)
Glanavon Fairy 9th	do.	....	3 5–43	4–7–46	273	19	8,367	4·26	356·93	D. Bevan & Sons	Blacklands Monarch's Commander (1877)
Capel Princess 8th	do.	....	24–7–43	8–8–46	180	41	8,820	4·02	354·99	B. W. Prowse	Capel Star King (4672)
Travalgan Lady Eion 17th	Jersey	....	29–5–43	5–7–46	273	11	5,135	6·77	347·89	K. V. Gray	Orphange Douglas (18919)
Tipperary Beauty 16th	A.I.S.	....	22–11 42	25–12–45	273	26	7,908	4·39	347·45	W. G. Burges	Tipperary Ace (6336)
Denmark Bonnie Princess	Guernsey	....	28–11–42	25–5–46	273	28	2,799	4·72	344·66	Denmark Research Station	Koojan Ideal's Reflection (4974)
Capel Dove 2nd	A.I.S.	....	18–5 43	25 5–46	273	19	7,962	4·25	338·42	B. W. Prowse	Capel Lottie's Reward (3782)
Eungella Telopia	Jersey	98286	20–5–43	8–6 46	273	8·5	5,807	5·81	337·87	D. G. Spark	Travalgan Starbright King (18129)
Wooroloo Red Gum	A.I.S.	....	18–4–43	15 6–46	273	16	7,728	4·34	335·49	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Wooroloo Gail	do.	....	28–2–43	1–4 46	273	10	7,290	4·55	332·22	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Wooroloo Polly 3rd	do.	....	6–6–43	21–8 46	273	10	7,155	4·62	330·82	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Muresk Anna	Guernsey	11058	28–9–42	14–12 45	273	24	7,332	4·50	330·33	Muresk Agricultural College	Koojan Ideal's Dictator (4167)
Muresk Delicia's Pride	do.	....	11–6 43	27–7–46	273	17	6,801	4·82	327·84	Muresk Agricultural College	Koojan Ace's Warspite (5943)
Wooroloo Sunlady 5th	A.I.S.	....	23 4 43	1 9–46	273	19	6,867	4·64	318·69	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Carbunup Fragrance	do.	....	10–2–43	27–4–46	240	16	6,915	4·57	316·68	D. H. Bell	Newstead Royal Sun (7252)
Radyr Park Estrellita 5th	Jersey	....	1–8–43	26–8–46	273	8	5,244	6·03	316·63	L. M. Temple	Navua September Lad (14023)
Lockridge Marina	Guernsey	10813	25–8–42	11–2–46	273	20	6,180	5·10	315·56	R. J. Giles	Koojan Beau Geste (4964)
Mayvale Daphne	do.	....	4–1 43	18–1–46	273	9·5	6,043	5·19	313·93	R. J. Giles	Koojan Ideal's Discoverer (4968)
Mayvale Golden Diana	do.	....	6–9–42	18 10–45	273	16	6,198	4·99	309·77	R. J. Giles	Koojan Ideal's Discoverer (4968)
Lansdowne Ideal's Pride	do.	....	9–1 43	6–4–46	240	18·5	5,790	5·33	308·64	J. R. Giles	Koojan Beau Ideal (4965)
Radyr Park September's Estrellita	Jersey	....	22–6 43	17–8–46	273	10	5,223	5·85	305·96	L. M. Temple	Navua September Lad (14023)

TABLE 9—HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS 3 YEARS AND UNDER 3½ YEARS—STANDARD 270 LB. BUTTERFAT											
Claremont Treasure 33rd	A.I.S.	....	21-9-42	23-10-45	273	23	7,809	3·87	302·28	Claremont Hospital for Insane	Summerlea Churchill (6236)
Kapara Iolanthe	Jersey	....	2-5-43	21-8-46	273	18	6,654	4·46	297·22	D. Bradford	Congelin Jolly Eminent 3rd (18425)
Wooroloo Emerald	A.I.S.	....	30-11-42	10-1-46	273	14	6,372	4·60	293·22	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Carbunup Freda	do.	....	8-7-43	9-8-46	240	7·5	7,380	3·91	288·63	D. H. Bell	Newstead Royal Sun (7252)
Claremont Mabel 27th	do.	....	24-11-42	27-12-45	273	26	7,248	3·97	288·04	Claremont Hospital for Insane	Summerlea Churchill (6236)
Wooroloo Heatherbell 2nd	do.	....	11-9-42	18-1-46	273	18	6,444	4·45	287·06	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Carbunup Fuchsia	do.	....	16-2-43	28-5-46	273	8	6,849	4·11	281·92	D. H. Bell	Newstead Royal Sun (7252)
Wooroloo Patsy	do.	....	9-9-42	21-12-45	273	6	6,123	4·60	281·71	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6570)
Clovelly Primrose	Guernsey	10245	30-6-42	30-9-45	273	14	5,487	5·05	277·59	Mrs. L. R. Barnsby	Koojan Monogram (4174)
Glanavon Rose 3rd	A.I.S.	....	23-4-42	13-10-45	273	14	6,012	4·52	271·91	D. Bevan & Sons	Blacklands Monarch's Commander (1877)
Clovelly Melba	Guernsey	....	21-6-43	6-7-46	273	10	5,595	4·76	266·80	Mrs. L. R. Barnsby	Landsdowne Polydymite (4995)
Rutherwood Daffodil	do.	....	18-5-43	24-6-46	273	16·5	5,329	4·94	263·52	Misses E. & I. Rutherford	Rutherwood Robin Adair (5238)
Clovelly Cherry	do.	10239	24-8-42	6-10-45	273	9	4,812	5·46	263·12	Mrs. L. R. Barnsby	Koojan Monogram (4174)
Carbunup Floxy	A.I.S.	....	19-2-43	11-5-46	240	2·5	6,090	4·18	254·88	D. H. Bell	Newstead Royal Sun (7252)
Walgett Handsome Girl 32nd	Jersey	....	21-4-43	30-5-46	240	12	4,680	5·29	247·98	C. J. Cunningham	Selsey Wyandottes Prince (18058)
Denmark Reflection's Dame	Guernsey	....	15-2-43	2-6-46	273	11·5	5,194	5·73	245·48	Denmark Research Station	Koojan Ideal's Reflection (4974)
Walgett Handsome Girl 31st	Jersey	....	20-4-43	1-5-46	273	12	5,196	4·33	225·34	C. J. Cunningham	Selsey Wyandottes Prince (18058)
Glanavon Doris 14th	A.I.S.	....	21-5-42	12-10-45	273	7	5,541	4·03	223·63	D. Bevan & Sons	Newstead Triumph (3420)
Kapara Bo-Peep	Jersey	....	17-5-43	17-6-46	273	4·5	4,753	4·66	221·80	D. Bradford	Congelin Jolly Eminent 3rd (82073)
Juadine March Flower 2nd	do.	....	30-9-43	15-10-46	180	8·5	3,495	6·17	215·79	J. P. Smith	Juadine Northwood Beau (19670)
Denmark Orange Pekette	Guernsey	....	12-6-43	12-7-46	273	3	4,629	4·59	212·49	Denmark Research Station	Koojan Ideal's Reflection (4974)
Rutherwood Annie	do.	....	7-5-43	28-6-46	273	12	4,371	4·82	210·74	Misses E. & I. Rutherford	Rutherwood Robin Adair (5238)
Plenarbor Daphne	A.I.S.	....	19-6-43	10-8-46	273	9·5	4,948	4·02	199·06	Mrs. V. Alexander	Glanavon Genius (3957)
Glanavon Ettie 4th	do.	....	18-10-42	24-2-46	240	6	4,200	4·45	186·93	D. Bevan & Sons	Glanavon Federal (6869)
Lenmoor's Roma	do.	....	16-8-43	7-9-46	150	12	4,260	4·01	170·88	W. K. Barnes	Ferndale Radiant (5729)
Flenarbor Gwen	do.	....	31-6-42	29-11-45	210	11·5	4,575	3·59	164·64	Mrs. V. Alexander	Glanavon Genius (3957)
Carydale Roberta	do.	....	13-3-43	4-5-46	180	12	3,660	3·89	142·65	M. H. Montgomery	Summerlea Robin Hood (5261)
Glanavon Gwen 3rd	do.	....	29-6-43	18-10-46	150	13	3,180	3·96	126·06	Burkitt & Brown	Blacklands Monarch's Commander (1877)
Lansdowne Ideal's Dainty	Guernsey	....	22-2-43	19-8-46	90	27	2,520	4·30	108·45	J. R. Giles	Koojan Beau Ideal (4965)
Glanavon Esmeralda 4th	A.I.S.	....	16-11-42	22-4-46	90	24	2,310	4·59	106·11	D. Bevan & Sons	Blacklands Monarch's Commander (1877)
Narrogin Charmer	do.	....	2-8-43	1-2-47	120	13	2,640	3·52	93·19	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)

Brookfields Gillian	Guernsey	....	4-3-43	14-7-46	120	15·5	1,020	4·31	82·83	P. G. Hampshire & Son	Yarraview Julian (4634)
Narrogin Diana	A.I.S.	....	13-11-43	14-2 47	90	15	1,935	3·95	76·62	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)

COWS 3½ YEARS AND UNDER 4 YEARS.—STANDARD 290 LB. BUTTERFAT.

Koojan Noblemark's Bo-Peep	Guernsey	....	19-12 42	6-10-46	273	29	10,557	5·46	577·07	A. W. Padbury	Koojan Ideal's Noblemark (5949)
Grass Vale Silvermine 2nd	Jersey	....	8-9-42	21-4 46	273	23	9,129	5·64	515·57	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Koojan Ace's Dianthus	Guernsey	10687	29-6-42	29-4-46	273	22	8,106	5·66	459·49	A. W. Padbury	Homestead Ace (Imp.) (1631)
Grass Vale Buttercup 11th	Jersey	....	5 7-42	23 4-46	273	16	7,218	6·05	436·71	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Denmark Reflectionette	Guernsey	....	15-11-42	19-10-46	273	18	7,329	5·77	423·21	Denmark Research Station	Koojan Ideal's Reflection (4974)
Claremont Maggie Morrison 48th	A.I.S.	....	6-8-42	9-4 46	273	34	11,202	3·76	421·24	Claremont Hospital for Insane	Summerlea Churchill (6236)
Claremont Whitby Maid 48th	do.	....	8-1-42	30-11 45	273	33	10,509	3·86	405·66	Claremont Hospital for Insane	Westby Monarch (5404)
Kiama Primrose 6th	do.	....	9-10 42	31-8 46	273	10	7,890	4·98	393·55	M. H. Montgomery	Liberton Patriot 6th (4134)
Lenmoor's Bluebell	do.	37898	12-4 42	25-3-46	273	22·5	10,492	3·69	387·70	G. W. Marston	Ferndale Memento (3194)
Lansdowne Bonnie Elizabeth	Guernsey	....	1-6 42	13-3 46	273	20·5	7,516	5·07	381·17	J. R. Giles	Koojan Beau Ideal (4965)
Kapara Velveteen	Jersey	93311	23-5 42	25-5 46	273	17	7,416	5·11	379·45	D. Bradford	Congelin Mandarin (14542)
Tipperary Fairy 9th	A.I.S.	....	27-9-42	21-6 46	273	14	8,712	4·26	371·32	W. G. Burges	Tipperary Ace (6336)
Wooroloo Wynette	do.	41212	2-4-42	6-4 46	273	9	8,127	4·40	358·38	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Wooroloo Gladys 2nd	do.	....	3-2-42	17-10-45	273	22	8,106	4·36	354·20	Wooroloo Sanatorium Farm	Wooroloo Red Baron (6412)
Clovelly Lily	Guernsey	10244	25-8-42	28 7-46	273	12	6,568	3·83	352·11	Mrs. L. R. Barnsby....	Lansdowne Polydymite (4995)
Lansdowne Ideal's Joybell	do.	....	21-11-42	22-7-46	273	15	7,005	4·98	349·09	J. R. Giles	Koojan Beau Ideal (4965)
Denmark Lady Dianna 2nd	do.	....	29-10-42	9 10 46	273	12	5,811	5·85	340·43	Denmark Research Station	Denmark Dawn's Appollo (4785)
Glanavon Topsy 3rd	A.I.S.	....	10 10 42	7-5-46	273	24	8,142	4·10	334·33	D. Bevan & Sons	Glanavon Federal (6869)
Glanavon Melba 6th	do.	....	22-12-42	12-7 46	273	12	7,806	4·19	327·15	D. Bevan & Sons	Glanavon Federal (6869) ...
Radyr Park Dorothy 20th	Jersey	....	17-6-42	12-5-46	273	15·5	6,451	4·89	315·54	L. M. Temple	Navua September Lad (14023)
Wooroloo Ena	A.I.S.	....	15-1 43	27 8-46	273	19	7,137	4·34	310·11	Wooroloo Sanatorium Farm	Berry Rufus 2nd (6579)
Kapara Sparkle's Lassie 2nd	Jersey	98818	14-10-42	30-4-46	273	8·5	6,775	4·53	306·97	D. Bradford	Congelin Jolly Eminent 3rd (18425)
Kapara Duchess	do.	....	14-9-42	16-5-46	273	10	5,445	5·58	304·14	D. Bradford	Congelin Mandarin (14542)
Eungella Miss Muffett	do.	92031	5-5-42	30-4 46	273	13	5,334	5·65	301·66	D. G. Spark	Travalgan Starbright King (18129)
Muresk Dame Enid	Guernsey	....	17-5-42	27-1 46	273	9	6,057	4·82	292·51	Muresk Agricultural College	Muresk Arthur (4338)
Southlyn Ada	A.I.S.	....	17-5 42	10 5-46	273	10	7,665	3·78	289·94	W. K. Barnes	Valliere Lancer (7592)
Camden Biddy	Jersey	....	1-7-42	11 2-46	273	16	5,358	5·26	282·23	Mrs. A. G. Eckersley	Greenmount Golden Bobbie (18578)
Warralyn Marie 10th	do.	89542	4-6-42	24-4 46	273	16·5	5,719	4·88	279·45	M. B. Stott	Juadine Sparkle's Wonder (18659)
Juadine Lily	do.	....	12 2-43	6-9 46	273	9	5,097	5·42	276·57	Mrs. A. G. Eckersley	Austral Park Wonderful Standard (12423)
Glanavon Sylvia 3rd	A.I.S.	....	12-10-42	17-4 46	273	12	6,306	4·33	273·54	D. Bevan & Sons	Blacklands Monarch's Commander (1877)
Narrogin Doreen	do.	....	13-8-42	26-3 46	240	23	6,795	3·83	260·85	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Yokanup Ulery	do.	....	18-10-42	12-7-46	273	13	6,879	3·67	252·93	Burkitt & Brown	Parkview Commodore (306)
Lenmoor's Joan 3rd	do.	....	20 7-42	23-7-46	240	17	6,360	3·92	249·60	G. W. Marston	Ferndale Memento (3194)
Brookfield's Clarette	Guernsey	10061	15 11-41	16-11-45	273	10	4,920	4·83	238·02	P. G. Hampshire & Son	Yarraview Clarinet (4628)
Walgett Handsome Girl 28th	Jersey	....	21-5 42	21-4-46	273	10·5	4,861	4·84	235·30	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Yokarnup Carnation 4th	A.I.S.	....	10-2-43	20-8-46	273	6	6,498	3·52	228·82	Burkitt &Brown	Parkview Commodore (306)
Yokanup Dahlia	do.	....	6-8-42	12-6-46	273	8	5,634	3·86	217·71	Burkitt & Brown	Parkview Commodore (306)
Tipperary Dove 21st	do.	....	14-4-42	9-1-46	210	7	5,160	3·92	202·38	W. G. Burges	Tipperary Ace (6336)

TABLE 9—HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS 3½ YEARS AND UNDER 4 YEARS—STANDARD 290 LB. BUTTER FAT—*continued.*											
Yokanup Gem 2nd	A.I.S.	....	23 1-43	15-10-46	180	15	5,280	3·39	179·49	Burkitt & Brown	Parkview Commodore (306)
Narrogin Sally	do.	....	26-4-42	18-3-46	210	12	4,515	3·96	178·98	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Kapara Dairymaid	Jersey	93308	24 6 42	15 5 46	120	18	2,820	5·21	147·03	D. Bradford	Congelin Mandarin (14542)
Narrogin Dainty	A.I.S.	....	2-5-42	26-3-46	90	22	2,490	4·09	101·94	Narrogin School of Agriculture	Westby Masterpiece (5403)
Narrogin Marion	do.	....	10-6-43	11-3 47	90	26	2,760	3·60	99·54	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Narrogin Milly	do.	....	5 5-42	16-3-46	90	20	2,040	3·93	80·25	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Narrogin Dora	do.	....	1 7 43	11 3-47	90	18	1,470	4·02	59·22	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Narrogin Dinah	do.	....	21 7 42	12 3 46	60	18·5	1,395	3·64	50·82	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
COWS 4 YEARS AND UNDER 4½ YEARS—STANDARD 310 LB. BUTTERFAT.											
Grass Vale Northwood Eve....	Jersey	92725	3-7-42	25-9-46	273	20	10.035	5·74	576·16	R. H. Rose & Sons	Mornmoot Northwood Beau (17798)
Grass Vale Norawood	do.	92724	27-6 42	9-8-46	273	18	7,674	5·40	414·42	R. H. Rose & Sons	Mornmoot Northwood Beau (17798)
Radyr Park Dorothy 19th	do.	95267	16-3-42	16-9-46	273	20	8,550	4·79	409·68	L. M. Temple	Navua Coronation Star (14929)
Grass Vale Magnolia 4th	do.	86645	23 11-41	17-3 46	273	12	6,726	5·96	401·49	R. H. Rose & Sons	Mornmoot Northwood Beau (17798)
Valliere Empress ....'	A.I.S.	....	14-4-42	12-9-46	273	26	10,173	3·92	399·43	B. W. Prowse	Wooroloo Searchlight (6415)
Capel Queen Regent	do.	....	2-5-42	20-8 46	240	13·5	8,520	4·22	359·97	B. W. Prowse	Capel Lottie's Reward (3782)
Tipperary Peggy 2nd	do.	40650	10 7-41	5-12-45	273	22	9,396	3·81	358·38	W. G. Burges	Tipperary Ace (6336)
Kapara Happy Days 2nd	Jersey	....	3 12 41	26 4 46	273	18	6,939	5·16	358·32	D. Bradford	Grantham Easter Oxford (14677)
Tirano Beauty	A.I.S.	....	11 9-41	5-2-46	273	31·5	9,169	3·88	356·02	J. Bensted & Co.	Chittering Prince (3800)
Carbunup Esther	do.	....	18-2 42	16 4 46	273	11·5	7,549	4·33	327·21	D. H. Bell	Glanavon Maestro (4833)
Yokanup Pansy	do.	....	16 1-42	6-6-46	273	18	7,194	4·28	308·08	Burkitt & Brown	Parkview Commodore (306)
Yokanup Carnation 3rd	do.	....	8-1 42	12 7 46	273	12	6,426	4·76	306·12	Burkitt & Brown	Parkview Commodore (306)
Tipperary Dove 18th	do.	40638	8 8-41	25-11-45	273	25	7,785	3·93	306·12	W. G. Burges	Tipperary Ace (6336)
Hades Topsy Turvey	do.	....	23-9 41	6-2 46	273	18	7,464	4·02	300·26	W. G. Burges	Hades Monarch (5800)
Clovelly Primrose	Guernsey	10245	30 6-42	30 8-46	273	13	6,219	4·74	295·03	Mrs. L. R. Barnsby	Koojan Monogram (4174)
Clovelly Cherry	do.	10239	24-8-42	30-8-46	210	12	5,790	5·05	292·50	Mrs. L. R. Barnsby	Koojan Monogram (4174)
Glanavon Golden Girl 6th	A.I.S.	36555	14-9 41	7 2 46	273	9	6,867	4·19	287·76	D. Bevan & Sons	Newstead Triumph (3420)
Walgett Lady Wyandotte	Jersey	....	29 4-42	27-6-46	240	9·5	5,805	4·86	282·33	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Denmark Dame 2nd	Guernsey	10289	6-11-41	14-2-46	273	22·5	5,722	4·80	274·69	Denmark Research Station	Denmark Lady's Goldseeker (4799)
Walgett Joy's Gift	Jersey	....	6 4 42	28 5-46	273	9	6,222	4·35	271·06	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Walgett Handsome Girl 25th	do.	....	7-4-42	1 7-46	240	10	5,400	4·82	260·28	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Juadine Peerless Lily 21st	do.	....	5-9-42	4-10-46	180	8·5	3,780	6·72	254·31	J. P. Smith	Austral Park Wonderful Standard (12423)
Clovelly Dainty	Guernsey	10241	5-8-41	2-1 46	273	5·5	5,026	5·04	253·54	Mrs. L. R. Barnsby	Koojan Monogram (4174)
Clovelly Bobette	do.	10238	12-7 41	9-10-45	273	12	4,746	5·25	249·33	Mrs. L. R. Barnsby	Koojan Monogram (4174)
Walgett Royal Lily	Jersey	....	26-3-42	23-5-46	240	10·5	5,175	4·78	247·59	C. J. Cunningham	Selsey Wyandotte's Prince (18058)

Lenmoor's Gentle	A.I.S.	....	22-5-42	29-5-46	273	9	6,762	3·59	242·82	G. W. Marston	Wooroloo Union Jack (7662)
Brookfield's Pixie	Guernsey	10073	15-5-41	9-11-45	240	10	5,265	4·50	236·97	P. G. Hampshire & Son	Yarraview Clarinet 2nd (4629)
Norinya Nita	Jersey	....	3-9-41	27-1-46	273	11	4,293	5·37	231·33	Mrs. A. G. Eckersley	Navua Royal Star (15869)
Lenmoor's Biddy	A.I.S.	....	22-3-42	17-4-46	273	11	6,483	3·56	231·03	G. W. Marston	Ferndale Radiant (5729)
Lenmoor's Queen 4th	do.	....	9-7-42	19-7-46	240	12	5,880	3·88	228·69	G. W. Marston	Ferndale Memento (3194)
Plenabor Valley	do.	....	15-2-42	17-7-46	210	9	5,745	3·66	210·27	Mrs. V. Alexander	Glanavon Genius (3957)
Clovelly Kitty	Guernsey	10243	20-6-42	6-7-46	210	11	4,340	4·82	209·10	Mrs. L. R. Barnsby	Lansdowne Polydymite (4995)
Rosella Jeanette	do.	....	2-4-42	20-7-46	210	12·5	3,750	5·35	200·67	Darnell Brothers	Muresk Commander (9599)
Plenabor Sapphire	A.I.S.	....	5-3-42	7-6-46	240	7·5	5,250	3·79	199·05	Mrs. V. Alexander	Glanavon Genius (3957)
Plenabor Primrose	do.	....	28-6-42	16-9-46	273	3	5,784	3·34	193·73	Mrs. V. Alexander	Glanavon Genius (3957)
Plenabor Curley	do.	....	26-6-42	23-10-46	210	8	5,430	3·36	182·91	Mrs. V. Alexander	Glanavon Genius (3957)
Lenmoor's Jean	do.	37899	22-4-42	10-10-46	180	13	4,815	3·56	171·87	G. W. Marston	Ferndale Memento (3194)
Capel Gibson Girl	do.	....	5-3-42	6-5-46	90	27	3,360	4·19	140·88	B. W. Prowse	Valliere Commodore (6360)
Koojan Ace's Bluebird	Guernsey	10686	9-6-42	3-9-46	120	12·5	2,565	4·80	123·33	Darnell Brothers	Homestead Ace (Imp.) (1631)
Rosella Girlie	do.	....	15-2-42	7-8-46	60	8	555	5·92	27·90	Darnell Brothers	Muresk Commander (4344)

COWS 4½ YEARS AND UNDER 5 YEARS.—STANDARD 330 LB. BUTTERFAT.

Grass Vale Buttercup 9th	Jersey	92713	24-5-41	7-5-46	273	24	9,852	6·02	593·91	R. H. Rose & Son	Grass Vale Gold Boy (14684)
Grass Vale Northwood Nora	do.	86646	23-5-41	31-3-46	273	19	8,172	6·27	512·79	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Grass Vale Lady Fowler 33rd	do.	92716	7-7-41	5-6-46	273	21	9,168	5·55	509·23	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Glanavon Maggie 2nd	A.I.S.	36563	21-2-41	14-11-45	273	32	11,571	4·31	499·72	M. H. Montgomery	Blacklands Monarch's Commander (1877)
Grass Vale Nora's Maid	Jersey	98527	9-9-41	5-6-46	273	19	9,507	5·04	479·33	R. H. Rose & Son	Mornmoot Northwood Beau (17798)
Denmark Ace's Dawn	Guernsey	10281	16-6-41	3-6-46	273	23	8,529	5·43	463·43	A. W. Padbury	Homestead Ace (Imp.) (1631)
Juadine Sally	Jersey	98755	5-10-41	19-5-46	273	23	8,769	5·00	438·78	M. B. Stott	Autral Park Wonderful Standard (12423)
Valliere Fairy 2nd	A.I.S.	40808	14-4-41	10-3-46	273	26	11,400	3·59	409·98	C. P. House	Wooroloo Searchlight (6415)
Tipperary Beauty 14th	do.	....	10-3-41	5-11-45	273	26	9,198	4·31	397·32	W. G. Burges	Tipperary Ace (6336)
Warralyn Dianthus 3rd	Jersey	89538	24-7-41	3-7-46	273	20·5	7,651	5·10	390·47	M. B. Stott	Juadine Hall Boy (16615)
Glanavon Fairy 6th	A.I.S.	36549	9-6-41	14-4-46	273	25	7,710	4·78	369·00	M. H. Montgomery	Blacklands Monarch's Commander (1877)
Wattle Creek Rosette	do.	40936	30-7-41	7-5-46	273	15	8,625	4·26	368·30	E. T. Thatcher	Wattle Creek Duchess' Monarch (5399)
Clovelly Crystal	Guernsey	10240	31-8-41	25-6-46	273	8·5	7,285	4·87	354·69	Mrs. L. R. Barnsby	Koojan Monogram (4174)
Grass Vale Golden Cream 25th	Jersey	92715	7-5-41	4-4-46	273	12	5,841	6·07	354·62	R. H. Rose & Son	Grass Vale Gold Boy (14684)
Radyr Park Dorothy 16th	do.	88643	4-6-41	10-4-46	273	17	6,666	5·24	349·39	L. M. Temple	Navua Coronation Star (14929)
Wattle Creek Buttercup	A.I.S.	....	5-1-42	20-7-46	273	7	7,791	4·44	345·95	E. T. Thatcher	Wooroloo Royal Standard (6414)
Mayvale Golden Bellona	Guernsey	10866	15-5-41	16-12-45	273	16	5,628	5·88	331·43	R. J. Giles	Koojan Ideal's Discoverer (4968)
Denmark Mary's Bonnie	do.	10295	22-7-41	9-2-46	273	19	5,832	5·23	305·47	Denmark Research Station	Denmark Lady's Goldseeker (4799)
Kapara Rosebud	Jersey	98310	8-6-41	3-5-46	273	10·5	5,536	5·36	396·88	D. Bradford	Congelin Mandarin (14542)
Radyr Park Dorothy 14th	do.	95266	22-4-41	6-3-46	273	17	6,246	4·61	287·96	L. M. Temple	Navua September Lad (14023)
Narrogin Dolly	A.I.S.	38669	20-8-41	27-3-46	240	22	6,615	4·16	275·22	Narrogin School of Agriculture	Westby Masterpiece (5403)
Wooroloo Ethel	do.	41179	2-4-41	10-1-46	273	10	6,150	4·34	267·52	Wooroloo Sanatorium Farm	Wooroloo Red Lad (5418)
Carbunup Dahlia	do.	35386	22-3-41	25-2-46	273	2·5	5,707	4·64	264·89	D. H. Bell	Glanavon Maestro (4833)
Wooroloo Lady Fair 5th	do.	41193	9-5-41	19-2-46	273	9	5,157	4·57	235·73	Wooroloo Sanatorium Farm	Wooroloo Triumph's Heir (4493)
Yanget Baron's Grace	do.	41223	3-9-41	2-6-46	273	5·5	6,121	3·57	218·58	Mrs. V. Alexander	Yanget Baron (6416)
Tipperary Dove 17th	do.	40637	26-3-41	6-12-45	273	6	5,448	3·81	207·65	W. G. Burges	Tipperary Ace (6336)
Wooroloo Daisybell 2nd	do.	41173	10-7-41	19-2-46	180	10	4,320	4·73	204·66	Wooroloo Sanatorium Farm	Wooroloo Red Lad (5418)
Narrogin Colleen	do.	38665	22-8-41	13-4-46	210	17	4,905	3·63	178·29	Narrogin School of Agriculture	Westby Masterpiece (5403)

TABLE 9—HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS 4½ YEARS AND UNDER 5 YEARS.—STANDARD 330 LB. BUTTERFAT											
Carydale Victoria Floss	A.I.S.	35396	15-7-41	16-4-46	180	17	4,485	3·76	168·66	W. K. Barnes	Summerlea Robin Hood (5261)
Muresk Danzie	Guernsey	11062	15-1-42	12-9-46	120	22	3,090	4·47	138·39	Muresk Agricultural College	Muresk Arthur (4338)
Narrogin Sally	A.I.S.	....	26-4-42	6 2 47	90	10	1,290	3·84	49·59	Narrogin School of Agriculture	Tipperary Amy's Mascot (6338)
Brookfields Morden Lady 5th	Guernsey	10071	20-10-41	27-5-46	30	24·5	735	5·38	39·60	P. G. Hampshire & Son	Yarraview Clarinet 2nd (4629)
COWS 5 YEARS AND OVER.—STANDARD 350 LB. BUTTERFAT.											
Glanavon Rosina	A.I.S.	30603	3-5-37	5-9-46	273	40	13,410	4·82	647·54	D. Bevan & Sons	Blacklands Jean's Supreme (1871)
Kooian Golden Jewel	Guernsey	8805	12-3-40	21 12 45	273	21	9,963	5·58	556·34	A. W. Padbury	Koojan Beau Ideal (4965)
Congelin Iolanthe 8th	Jersey	80828	22 4-40	21-6-46	273	28·5	10,810	4·93	533·96	D. Bradford	Rosecliffe Marchalong (15094)
Wallatin Fairy 3rd	A.I.S.	40883	17-5-40	9-5-46	273	27	14,661	3·59	527·35	B. W. Prowse	Summerlea Pioneer (6240)
Wooroloo Poppy 2nd	do.	23265	4-5-35	29-3-46	273	34	11,577	4·48	519·65	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Congelin Rose Marie 6th	Jersey	80830	14-4-40	16-4 46	273	24	8,067	6·38	514·89	D. Bradford	Rosecliffe Marchalong (15094)
Grass Vale Buttercup 7th	do.	81622	9-9-39	20-8-46	273	23	9,264	5·10	473·33	R. H. Rose & Son	Grass Vale Gold Boy (14684)
Wooroloo Lilac 2nd	A.I.S.	33993	18-12-39	22-7-46	273	20	10,440	4·43	463·00	Wooroloo Sanatorium Farm	Wooroloo Triumph's Heir (4493)
Carbunup Beatrice	do.	29617	13-3-39	13-3-46	273	26	10,788	4·28	462·12	D. H. Bell	Glanavon Maestro (4833)
Tipperary Beauty 9th	do.	40631	21 2-40	19-4-46	273	23	10,809	4·26	461·40	W. G. Burges	Blacklands Monarch's Commander (1877)
Tipperary Beauty 11th	do.	40633	20 9 40	9-3-46	273	29	10,257	4·49	461·02	M. H. Montgomery	Liberton Venturer (4988)
Tipperary Beauty 6th	do.	28217	8 8 38	2 5-46	273	18	10,344	4·40	455·14	W. G. Burges	Newstead Tourist (3419)
Congelin Iolanthe 10th	Jersey	91295	25-3 41	15-4 46	273	26	9,438	4·78	451·18	D. Bradford	Congelin Washington (14826)
Denmark Briar Rose	Guernsey	6959	15-8-37	31-8-46	273	17	8,616	5·02	432·57	Denmark Research Station	Denmark Illustrious (3320)
Tipperary Lovely 5th	A.I.S.	40645	10 6 41	5-7-46	273	18	10,074	4·25	428·39	W. G. Burges	Tipperary Ace (6336)
Radyr Park Dorothy 4th	Jersey	63850	5-10-35	23 5 46	273	20	8,355	5·00	417·80	L. M. Temple	Greenmount Graceful Lad (7292)
Claremont Pinafore 12th	A.I.S.	35549	25 7-40	2-10 45	273	32	10,806	3·82	413·86	Claremont Hospital for Insane	Westby Monarch (5404)
Carbunup Baroness	do.	29616	15-4-39	30-5-46	210	17·5	9,855	4·16	410·73	D. H. Bell	Glanavon Maestro (4833)
Valliere Melba	do.	33717	8-9-39	7-2-46	273	19	11,085	3·68	408·90	C. P. House	Alfa Vale Patrico (3649)
Tirano Topsy	do.	33580	15-10 38	14-6-46	273	19	8,577	4·75	407·58	M. H. Montgomery	Inverell Gold's Pride (4079)
Radyr Park Dorothy 10th	Jersey	83556	4-7 39	31 8-46	240	15	8,970	4·53	406·80	L. M. Temple	Navua Coronation Star (14929)
Inverell Gold Lady	A.I.S.	37427	9-10-38	26-8 46	273	17	9,711	4·11	399·35	W. G. Burges	Blacklands Monarch's Commander (1877)
Wooroloo Wendy 4th	do.	34005	14 9-39	13 10 45	273	20	8,650	4·57	396·08	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Valliere Judy	do.	40816	15-4-41	3-5-46	273	8	10,479	3·77	395·22	C. P. House	Wooroloo Searchlight (6415)
Muresk Lady Boniface	Guernsey	11067	23-4 41	24-5-46	273	16	6,558	5·89	386·68	Muresk Agricultural College	Denmark Damon (2519)
Congelin Sparkle 4th	Jersey	91297	15-3 41	13-5-46	273	20	8,850	4·36	386·18	D. Bradford	Congelin Washington (18426)
Valliere Star	A.I.S.	33720	28-3-39	15-3 46	273	15	9,735	3·86	375·93	C. P. House	Alfa Vale Patrico (3649)

Clovelly Golden Pride	Guernsey	8501	26-10-38	25-6 46	273	8	7.584	4·94	374·84	Mrs. L. R. Barnsby ...	Drakesbrook Golden Gilt (2651)
Wooroloo Pigeon	A.I.S.	41198	20 9 40	5-7-46	273	14	8,682	4·30	373·96	Wooroloo Sanatorium Farm	Wooroloo Triumph's Heir (4493)
Denmark Golden Valencia 2nd	Guernsey	8535	15-9-39	17-3 46	273	25	7,830	4·75	372·22	Denmark Research Station	Koojan Ace's Goldseeker (3431)
Denmark Rosemary	do.	5451	7-6 36	28-1-46	273	14	6,852	5·40	370·59	Denmark Research Station	Koojan Golden Prosper (2283)
Wooroloo Faith	A.I.S.	33989	10 1-39	7-1 46	273	16	8,568	4·30	368·81	Wooroloo Sanatorium Farm	Glanavon Genius (3957)
Radyr Park Coronation's Estrellita	Jersey	83555	27-7-39	2-6-46	273	19	7,272	5·06	368·14	L. M. Temple ...	Navua Coronation Star (1492)
Valencia Vale Chloe	do.	....	8-6-40	23 7-46	273	13	5,799	6·34	368·05	K. V. Gray	Grass Vale Fowler's Twylish (12733)
Denmark Golden Glory	Guernsey	6965	13 5-38	29 7 46	273	19	7,317	4·98	364·73	Denmark Research Station	Denmark Damon (2519)
Melrose Butterscotch	A.I.S.	38269	5 3-40	17-10-45	273	15·5	8,716	4·15	362·56	M. H. Montgomery	Tipperary Defiance (5329)
Warralyn Marie 5th	Jersey	84475	14 8-39	6 3 46	273	16	6,513	5·50	359·22	M. B. Stott	Juadine Hall Boy (16615)
Camden Circe	do.	80637	24 9-39	23 7-46	273	11	6,093	5·77	352·09	C. E. Kruger	Greenmount Golden Sultan (14688)
Muresk Delia	Guernsey	9105	11-5 39	29-4-46	273	19	8,217	4·27	351·60	Muresk Agricultural College	Denmark Damon (2519)
Denmark Golden Dawn	do.	4118	9 1 33	30-10-45	273	14	6,117	5·67	346·89	Denmark Research Station	Koojan Golden Prosper (2283)
Radyr Park Dorothy 5th	Jersey	68752	18 7-36	5 7-46	273	11	6,393	5·40	345·53	L. M. Temple	Greenmount Graceful Lad (7292)
Eungella Dark Venus	do.	92030	18 5-41	15 6-46	273	3	7,209	4·77	344·31	D. G. Spark	Travalgan Starbright King (18129)
Greenmount Golden Gem	do.	76619	5 7 37	11-6-46	273	9	6,552	5·24	343·75	D G. Spark	Bellefaire Bonaparte's Bonetienne (9224)
Clovelly Golden Flirt	Guernsey	8500	1-6-39	25 7 46	273	8	6,504	5·23	340·53	Mrs. L. R. Barnsby....	Koojan Monogram (4174)
Clovelly Rose	do.	6931	1 10-36	6 6-46	273	10	6,525	5·20	339·21	Mrs. L. R. Barnsby....	Muresk Achilles (1543)
Melbury Janet	A.I.S.	26505	18 7-37	30 3-46	273	16	8,163	4·15	339·18	G. W. Marston	Telyarup Roosevelt (1538)
Valliere Buttercup	do.	40796	9 5-40	25 3-46	273	12	8,796	3·81	338·42	C. P. House	Alfa Vale Patrico (3649)
Norinya Noreen	Jersey	73200	6 11-37	25 8-46	273	11	7,338	4·61	338·37	Mrs. A. G. Eckersley	Juadine Prince (14760)
Valliere Primrose	A.I.S.	....	19-5-40	13-5 46	240	23	7,980	4·21	335·96	W. K. Barnes	Alfa Vale Patrico (3649)
Mayvale Rosy Aster	Guernsey	10870	27-9-40	9 7 46	273	17	8,231	5·38	335·66	R. J. Giles	Denmark Rosy Outlook (4017)
Brookfields Lady Lynette ...	do.	5327	21-7-34	17-6 46	273	13·5	7,375	4·54	335·47	Darnell Brothers	Koojan Lord Barklay (1031)
Valliere Kate	A.I.S.	40817	28-6 40	19-3 46	273	16	9,118	3·67	334·70	C. P. House	Alfa Vale Patrico (3649)
Wooroloo Poppy 4th	do.	28654	12 4 38	6-3 46	273	15	7,560	4·40	332·92	Wooroloo Sanatorium Farm	Parkview Guardian (2557)
Claremont Cherry 9th	do.	15955	25-11-34	27-5-46	273	19	8,412	3·93	330·91	Narrogin School of Agriculture	Tipperary Virginia's Re-echo (970)
Noorong Dahlia	Jersey	....	26-12-39	17-8-46	273	8	6,654	4·96	330·42	K. V. Gray	Clarendon Eyre Eminent's Geishar 4th (13597)
Clovelly Bella	Guernsey	8496	20-10-39	1 5 46	273	16	6,393	5·15	329·40	Mrs. L. R. Barnsby	Koojan Monogram (4174)
Camden Patsy	Jersey	85543	27-6-39	2 1 46	273	14	5,352	6·12	327·86	C. E. Kruger	Greenmount Golden Sultan (14688)
Glanavon Daphne 3rd	A.I.S.	25165	13-2-37	21 9-46	273	12	9,246	3·52	325·63	Burkitt & Brown	Parkview Commodore (306)
Eungella Coquette	Jersey	81271	24 5-40	6-5-46	273	15	6,255	5·20	325·59	D. G. Spark	Greenmount Golden Sovereign (14687)
Glanavon Bluebell	A.I.S.	25157	1-3-36	31-5-46	210	20	7,560	4·24	320·58	G. W. Marston	Glanavon Nimrod (437)
Clovelly Margaret	Guernsey	6929	20-11-37	20 6-46	273	4	6,312	5·03	317·26	Mrs. L. R. Barnsby	Nornabank Brian (3640)
Carbunup Crocus	A.I.S.	35385	25 2-40	13 3-46	273	3	7,809	4·03	315·15	D. H. Bell	Glanavon Maestro (4833)
Rutherwood Rosebud	Guernsey	7827	15-7-37	12-3-46	273	18	6,459	4·80	310·63	Misses E. & I. Rutherford	Denmark Robin Hood (3322)
Clovelly Bobette	do.	10238	12-7-41	5-10-46	240	11·5	5.775	5·37	310·11	Mrs. L. R. Barnsby ...	Koojan Monogram (4174)
Muresk Treasure	do.	9118	12 7-39	22 6-46	240	12	6.450	4·79	309·06	Muresk Agricultural College	Muresk Homestead (2075)

TABLE 9—HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS 5 YEARS AND OVER.—STANDARD 350 LB. BUTTERFAT—*continued.*											
Radyr Park June 2nd	Jersey	88645	16-5-41	8-8 46	273	11	6,603	4·67	308·61	L. M. Temple	Navua Coronation Star (14929)
Eungella Bo-peep	do.	71246	27 12 37	26-4 46	273	16	7,193	4·28	308·41	D. G. Spark	Greenmount Golden Sovereign (14687)
Salem View Topsy 2nd	A.I.S.	13949	9-1 33	24-11-45	273	35	8,835	3·47	307·29	Mrs. E. L. Brockman	Kinsman of Greyleigh (111)
Clovelly Golden Dawn	Guernsey	8499	15-10-39	17-5-46	273	9·5	5,863	5·22	306·36	Mrs. L. R. Barnsby....	Koojan Monogram (4174)
Radyr Park Coronation Belle	Jersey	73600	5 7-38	11-7 46	240	13	6,890	4·74	302·94	L. M. Temple	Navua Coronation Star (14929)
Denmark Atalie	Guernsey	5436	23-6-34	5 4-46	273	20	6,795	4·49	302·31	Misses E. & I. Rutherford	Koojan Golden Prosper (2283)
Carbunup Constance	A.I.S.	35384	25-2-40	27-3-46	273	2	7,341	4·10	301·30	D. H. Bell	Glanavon Maestro (4833)
Walgett Easter Lily	Jersey	69576	20-4-37	15 4-46	273	15	6,870	4·34	298·74	C. J. Cunningham	Walgett Beau's Masterpiece (13349)
Glanavon Aster	A.I.S.	30575	18-1-38	21-2 46	273	10	7,140	4·16	297·15	D. H. Bell	Glanavon Nimrod (437)
Carbunup Doris	do.	35389	3 8-41	14-8-46	240	3·5	7,785	3·78	294·78	D. H. Bell	Glanavon Maestro (4833)
Glanavon Vida 4th	do.	36591	16-9-40	7-6-46	273	18	8,664	3·40	294·72	Burkitt & Brown ...	Tipperary President (5335)
Westlawn Daisy	do.	40999	5-6-40	19-10 45	210	9·5	6,975	4·22	294·42	Mrs. E. L. Brockman	Claremont Mount Rufus (3803)
Clovelly Wavelet	Guernsey	10247	28-5 41	31-7-46	273	2	6,606	4·45	294·28	Mrs. L. R. Barnsby....	Koojan Monogran (4174)
Lenmoor's Queen 2nd	A.I.S.	37904	24-7-40	25 2-46	273	18·5	8,200	3·57	292·87	G. W. Marston	Lenmoor's Gem (4977)
Glanavon Pansy 4th	do.	30599	10-11-37	13-9 46	240	7	6,750	4·31	290·96	Burkitt & Brown ...	Blacklands Jean's Supreme (1871)
Denmark Golden Maria	Guernsey	8529	27-6-40	6-6-46	273	12	5,181	5·59	289·85	Denmark Research Station	Denmark Damauric (4000)
Walgett Joyful	Jersey	79450	29-8-38	24-4-46	273	12	5,601	5·08	284·81	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Brookfield's Mignonette	Guernsey	5329	18-6-35	11-4 46	273	14	6,087	4·67	284·66	Darnell Brothers	Koojan Lord Barclay (1031)
Lenmoor's Joan	A.I.S.	31611	13-8 39	27-2-46	273	16·5	8,014	3·52	282·63	G. W. Marston	Longridge Blanche's Emblem (3344)
Denmark Dawn 2nd	Guernsey	5439	21-3 35	23-2 46	273	16	5,508	5·12	282·47	Denmark Research Station	Koojan Golden Prosper (2283)
Walgett Jocelyn	Jersey	89500	13-8-40	24-3-46	273	21	5,718	4·91	280·95	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Congelin Iolanthe 11th	do.	91296	21-3-41	26-6 46	273	5·5	5,866	4·95	280·46	D. Bradford	Congelin Washington (18426)
Koojan Ideal's Judith	Guernsey	10696	24-6-40	25-12-45	180	17	5,040	5·51	278·07	A. W. Padbury ...	Glenburnie Ideal (Imp.) (2548)
Valliere Milkmaid	A.I.S.	40824	15-4-40	27-3 46	273	7	7,011	3·95	277·09	W. K. Barnes	Alfa Vale Patrico (3649)
Walgett Heirloom	Jersey	89499	20-4-40	22 3-46	273	9	5,367	5·15	276·76	C. J. Cunningham ...	Sabina Vale Betty's Beau (10018)
Denmark Diana	Guernsey	6963	28-6-36	22-11-45	273	17	6,006	4·60	276·53	Denmark Research Station	Denmark Damon (2519)
Westby Carnation 5th	A.I.S.	40984	25 6-39	28 8-46	273	7	7,881	3·50	275·94	Burkitt & Brown	Westby Star (5406)
Claremont Flora	do.	15961	27-8-34	10 6-46	273	21	8,508	3·24	275·93	Narrogin School of Agriculture	Claremont Herdsman (968)
Rutherwood Maid Marion	Guernsey	9328	11-1-39	3-6-46	273	14	6,417	4·29	275·45	Misses E. & I. Rutherford	Denmark Robin Hood (3322)
Narrogin Charlotte	A.I.S.	38663	13 4-40	22-5-46	273	23	8,049	3·35	270·21	Narrogin School of Agriculture	Westby Masterpiece (5403)
Juadine Peerless Lily 17th	Jersey	81991	18-12-39	31-5-41	240	11	4,380	6·13	268·80	Mrs. A. G. Eckersley	Austral Park Wonderful Standard (12423)
Koojan Golden Ripple	Guernsey	7248	26-3-38	27 6-46	273	14	5,607	4·74	265·85	Denmark Research Station	Homestead Ace (Imp.) (1631)

Narrogin Donna	A.I.S.	32144	27-10-39	8-7-46	273	9	7,407	3·57	264·51	Narrogin School of Agriculture	Woorolooo Sterling 3rd (3626)
Mokine Amy 7th	Jersey	87916	1-8-39	25-4-43	240	13	5,190	5·07	263·46	K. V. Gray	Selsey Hall Boy (15136)
Walgett Handsome Girl 16th	do.	84439	29-3-39	31-5-46	240	9·5	5,385	4·88	263·22	C. J. Cunningham	Walgett Masterman (15271)
Walgett Handsome Girl 5th	do.	59902	7-4-35	12-5-46	240	12	5,550	4·71	261·81	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Walgett Handsome Girl 13th	do.	79448	2-5-38	24-4-46	273	13	5,994	4·31	258·78	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Narrogin Daisybell	A.I.S.	38668	10-10-40	6-3-46	273	2·5	5,932	4·34	257·65	Narrogin School of Agriculture	Westby Masterpiece (5403)
Rutherwood Robin's Daisy	Guernsey	9329	11-9-38	1-4-46	273	14·5	5,143	4·99	257·07	Misses E. & I. Rutherford	Denmark Robin Hood (3322)
Walgett Handsome Girl 4th	Jersey	59901	5-4-35	6-5-46	240	11	5,130	4·97	255·06	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Denmark Bonnie Mary	Guernsey	6958	30-9-37	23-4-46	273	16	6,033	4·20	253·51	Denmark Research Station	Denmark Illastrious (3320)
Walgett Handsome Girl 12th	Jersey	79447	24-4-38	27-5-46	240	13	6,180	4·06	251·28	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Walgett Handsome Girl 10th	do.	84440	6-4-39	17-5-46	240	9	4,665	5·35	249·72	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Walgett Handsome Girl 9th	do.	69578	16-5-37	12-7-46	210	8	5,340	4·64	247·98	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Clovelly Dainty	Guernsey	10241	5-8-41	10-10-46	240	9	5,670	4·35	247·20	Mrs. L. R. Barnsby	Koojan Monogram (4174)
Eungella Bonetta	Jersey	92029	17-5-41	11-8-46	210	2·5	4,755	5·18	246·33	D. G. Spark	Travalgan Starbright King (18129)
Denmark Rosette	Guernsey	6972	21-7-36	30-5-46	273	8	5,034	4·69	235·92	Denmark Research Station	Koojan Golden Prosper (2283)
Camden Arachne	Jersey	80635	9-9-39	27-9-46	273	8	4,449	5·28	234·94	C. E. Kruger	Greenmount Golden Sultan (14688)
Westby Laurel	A.I.S.	40986	7-2-40	26-4-46	273	17	5,826	4·01	234·12	Narrogin School of Agriculture	Westby Searchlight (3604)
Rosella Zinnia	Guernsey	11430	11-8-40	3-5-46	273	6	4,473	5·17	231·24	Darnell Brothers	Muresk Paul (4356)
Denmark Velvet	do.	8540	23-8-38	24-11-45	240	14	5,220	4·42	230·94	Denmark Research Station	Denmark Auric (3313)
Rutherwood Rosalyn	do.	6264	18-8-35	11-9-46	273	11·5	4,879	4·70	229·60	Misses E. & I. Rutherford	Denmark Rosa's Prosper (2639)
Plenarbor Tulip	A.I.S.	39216	4-4-40	26-6-46	240	7·5	6,645	3·45	229·08	Mrs. V. Alexander	Aine Bank Tena's Gift (1766)
Walgett Golden Duchess	Jersey	79446	21-5-38	5-4-36	273	8·5	5,110	4·45	227·74	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Denmark Dawn Childe	Guernsey	6962	14-5-37	24-12-45	240	10	4,575	4·71	225·81	Denmark Research Station	Wollongbar Reformer (538)
Denmark Angeline	do.	6956	4-7-37	29-10-45	273	12·5	4,792	4·70	225·62	Denmark Research Station	Koojan Golden Prosper (2283)
Walgett Handsome Girl 20th	Jersey	84441	21-4-39	10-7-46	180	13·5	4,275	5·14	220·11	C. J. Cunningham	Sabina Vale Betty's Beau (10018)
Walgett Melanie	do.	....	10-4-41	17-7-46	180	11·5	4,590	4·72	216·75	C. J. Cunningham	Selsey Wyandotte's Prince (18058)
Muresk Golden Pearl	Guernsey	9107	9-10-39	16-11-45	240	15	4,140	5·14	213·18	Muresk Agricultural College	Muresk Homestead (2075)
Narrogin Stella	A.I.S.	38676	19-4-40	21-4-46	210	11	5,175	4·10	212·58	Narrogin School of Agriculture	Westby Masterpiece (5403)
Claremont Duchess 2nd	do.	9920	17-10-33	12-4-46	240	8·5	7,110	2·81	200·25	Narrogin School of Agriculture	Tipperary Virginia's Re-echo (970)
Yanget Graceful 4th	do.	....	9-10-39	23-7-46	273	5·5	5,747	3·47	199·37	Mrs. V. Alexander	Leylands Defiance (2380)
Noorong Grace	Jersey	78124	3-10-33	21-3-46	240	6	4,005	4·71	188·97	C. E. Kruger	Grass Vale Butter King (8209)
Brookfields Sonata	Guernsey	10081	1-10-40	9-3-46	240	12	3,510	5·13	180·24	P. G. Hampshire & Son	Yarraview Clarinet 2nd (4629)
Carbunup Dora	A.I.S.	35388	1-4-41	29-4-46	120	33	4,755	3·73	177·39	D. H. Bell	Glanavon Maestro (4833)
Narrogin Minnie	do.	38671	25-11-39	4-3-46	120	20	4,215	4·20	177·30	Narrogin School of Agriculture	Wooroloo Sterling 3rd (3626)
Rosella Queenie	Guernsey	9316	20-9-39	19-7-46	210	9	3,750	4·62	173·40	Darnell Brothers	Muresk Paul (4356)
Inverell Gold Lady	A.I.S.	37427	9-10-38	19-12-45	210	9	4,560	3·79	172·86	W. G. Burges	Blacklands Monarch's Commander (1877)
Plenarbor Dandelion	do.	39210	30-12-39	28-2-46	210	14	4,425	3·80	168·57	Mrs. V. Alexander	Tipperary Empress' Monarch (4436)
Yanget Daphne 5th	do.	34021	15-9-38	19-2-46	240	10·5	4,470	3·70	165·66	Mrs. V. Alexander	Blacklands Lancer (1874)
Rosella Sweetheart	Guernsey	11429	30-7-40	11-10-46	120	16	3,000	5·01	150·30	Darnell Brothers	Muresk Paul (4356)
Brookfields Prudence	do.	8389	12-1-40	4-12-45	273	5	2,630	5·68	149·59	P. G. Hampshire & Son	Yarraview Clarinet (4628)
Mokine Empire's Girl	Jersey	82897	26-7-39	6-9-46	120	19	3,120	4·73	147·81	K. V. Gray	Selsey Hall Boy (15136)

TABLE 9—HERD TESTING—*continued.*

Name of Cow.	Breed.	Herd Book No.	Date of Birth.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk on Last Day of Test. lb.	Weight of Milk for Period. lb.	Average Test. %	Weight of Butter Fat for Period. lb.	Owner.	Sire.
COWS 5 YEARS AND OVER—STANDARD 350 LB. BUTTER FAT.—*continued.*											
Denmark Golden Dawn 2nd	Guernsey	8527	2-4-40	1-11-46	210	5·5	2,640	5·57	147·15	Denmark Research Station	Koojan Ace's Goldseeker (3431)
Brookfields Bonnie Blossom	do.	5319	15-8-34	3-10-46	120	19·5	3,300	4·44	146·70	Darnell Brothers	Koojan Lord Barklay (1031)
Narrogin Clara	A.I.S.	38664	19-3-40	16-3-46	240	9	3,765	3·70	139·50	Narrogin School of Agriculture	Westby Masterpiece (5403)
Koojan Ace's Dulcie	Guernsey	5658	6-3-36	13-4-46	90	27	2,790	4·88	136·41	Denmark Research Station	Homestead Ace (Imp.) (1631)
Vinewood Sweet Ginger	Jersey	59890	8-10-34	24-12-46	90	20·5	2,340	5·23	122·43	J. P. Smith	Moorlands Duke (11908)
Grass Vale Silvermine	do.	81639	6-11-40	14-4-46	60	39	2,220	5·32	118·26	R. H. Rose & Son	Grass Vale Gold Boy (14684)
Clovelly Duchess	Guernsey	8497	8-7-38	19-4-46	120	17	2,370	4·79	113·64	Mrs. L. R. Barnsby....	Muresk Nelson (3620)
Brookfield's Hope	do.	5325	14-9-34	12-10-46	120	14·5	2,595	4·24	110·25	Darnell Brothers	Koojan Lord Barklay (1031)
Congelin Happy Days 3rd	Jersey	85704	1-2-41	19-5-46	90	22	2,190	4·66	102·21	D. Bradford	Congelin Washington (18426)
Plenarbor Dandelion	A.I.S.	39210	30-12-39	13-12-46	150	10	3,120	3·20	99·96	Mrs. V. Alexander	Tipperary Empress' Monarch (4436)
Brookfields Primrose	Guernsey	5331	24-2-35	8-9-46	150	7	2,055	4·84	99·66	Darnell Brothers	Koojan Ace's Majestic (2735)
Rosella Queen	do.	9315	3-7-39	26-6-46	90	14	2,070	4·50	93·30	Darnell Brothers	Muresk Paul (4356)
Denmark Jonquil	do.	8536	24-4-40	30-5-46	120	16	1,965	4·43	87·06	Denmark Research Station	Koojan Beau Ideal (4965)
Rosella Duchess 2nd	do.	9310	7-5-39	6-7-46	120	13	1,665	4·32	71·97	Darnell Brothers	Muresk Paul (4356)
Grass Vale Twylish Lady	Jersey	76604	14-10-38	8-8-46	30	42	1,260	4·74	59·76	R. H. Rose & Son	Grass Vale Gold Boy (14684)
Narrogin Maisie	A.I.S.	32146	1-11-38	4-4-46	60	28	1,680	3·42	57·60	Narrogin School of Agriculture	Wooroloo Sterling 3rd (3626)
Denmark Mary Rose	Guernsey	6966	7-7-38	24-2-47	30	36	1,080	5·30	57·24	Denmark Research Station	Denmark Auric (3313)
Clovelly Tigress	do.	10246	11-7-40	20-5-46	60	17	1,140	4·45	50·79	Mrs. L. R. Barnsby. ..	Koojan Monogram (4174)
Narrogin Daisy	A.I.S.	38667	20-11-39	8-4-46	60	20	1,290	3·05	39·45	Narrogin School of Agriculture	Wooroloo Sterling 3rd (3626)
Glanavon Vida 3rd	do.	30609	19-5-39	29-7-46	60	25	1,500	2·42	36·30	Burkitt & Brown	Parkview Commodore (306)
Westby Polly	do.	15141	21-5-32	21-5-46	30	35	1,050	2·92	30·66	Narrogin School of Agriculture	Telyarup Duke (956)
Rosella Lady Luck	Guernsey	9313	28-7-38	2-10-46	30	19	570	4·59	26·19	Darnell Brothers	Brookfields Baron (3936)
Clovelly Queen	do.	6930	1-7-36	9-7-46	30	21	630	4·03	25·41	Mrs. L. R. Barnsby....	Koojan Sir Garnet (847)

NEW CEREAL VARIETIES IN WESTERN AUSTRALIA.

By

I. Thomas, Registrar of Cereal Varieties in Australia.

During 1947 one new wheat variety and one oat variety were submitted for registration by the Victorian Department of Agriculture. Particulars of the varieties are as follows :—

Diadem.—A wheat variety of midseason to late maturity, originating from a cross between Ghurka and White Fife made at the State Research Farm, Werribee, Victoria, in 1932 by Mr. A. R. Raw. Subsequent selection was carried out at the Longerenong Agricultural College, Victoria. The straw is white and short, although a little longer than the parent Ghurka, with good standing ability. It has a compact square head which threshes readily. The grain is attractively bright coloured and is semi-translucent ; flour strength is in the medium strong class, being markedly superior to Ghurka and Quadrat, which varieties the Victorian Department of Agriculture recommends it to replace.

Diadem possesses a moderate resistance to flag smut, but is susceptible to rust. Its main outstanding ability is its prolificacy. In replicated yield trials extending over six years at Longerenong College, Diadem, as selection L5266/T39–1–1 of the cross (Ghurka x White Fife), was the leading variety, having an average yield of 29·1 bushels per acre as compared with Quadrat 27·7, Magnet 27·2 and Ghurka 25·9. The Victorian Department of Agriculture recommends this variety as being more suitable for the " Wimmera Plains " than for the drier or earlier districts.

Orient.—An oat variety of parentage Palestine x Dawn, crossed at the State Research Farm, Werribee, by Mr. A. R. Raw in 1930. Subsequent selection was carried out at the Mallee Research Station, Walpeup. It is an early maturing variety possessing short, fairly strong straw, good stooling ability, prostrate early growth and a relatively long rosette stage with a short post jointing stage. Grain is large and plump with a dark coloured husk and the yield ratio of grain to hay is high.

Orient is not recommended as a hay variety for sowing on non-fallowed land, and has been selected mainly as a grazing oat which, in late season grazing, returns higher yields of greenstuff than Dawn or Algeribee. Under conditions at Walpeup, where the variety was tested for eleven years, it was found that Orient could be grazed later in the season than other early maturing oats, while still retaining the ability of giving a reasonable grain return.

ERRATA.

Vol. XXIV., No. 3.—September, 1947.

Page 219.—Agricultural Problems—

For

" Bridgetown . . . . K. M. Simes (Dairying) : A. Flintoff (Fruit) "

substitute

" Bridgetown . . . K. M. Simes (Dairying) : T. Herlihy (Fruit)."

Pages 222–225.—Repeat 300,000 ; 200,000 ; 100,000 for each factory.

Page 226.—Last paragraph, line five—

For

" to 6·9, pH 7·0 to 7·2, and values greater than 7·2 pH "

substitute

" to 6·9, pH 7·0 to 7·2, and values greater than pH 7·2."

Page 228.—Author—

For

" C. A. Gardiner, Government Botanist " *substitute*

" C. A. Gardner, Government Botanist."

Page 247.—Line one of note at foot of page—

For " three shillings " *substitute* " six shillings."

POULTRY FEEDING EXPERIMENTS No. 3.

By R. H. Morris, Agricultural Adviser.

INTRODUCTION.

The 1947 March issue of this Journal contains an article outlining a series of poultry feeding experiments at present being conducted at Muresk Agricultural College. In the September issue, Dr. L. C. Snook discussed the rations being fed in these experiments in some detail.

The purpose of these articles was to provide a background for the present and subsequent articles which will present information gained from the experiments as they progress, and which will appear in this Journal at intervals during the next eighteen months.

To ensure continuity, readers are advised to refer to the two introductory articles mentioned, along with the present one.

The purpose of this article is to present information which the experiments have yielded during the first six months. At the moment certain trends are evident ; these may or may not continue. The ensuing six months will help to complete the picture and the following year should reveal even more important information.

Readers are reminded that the experimental flock comprises 600 laying fowls, containing six experimental groups. Each group comprises 100 fowls, 50 of which are Australorps and 50 of which are White Leghorns. Portion of the experimental flock is shown in the accompanying photograph ; the White Leghorns are housed in the even numbered pens and the Australorps in the odd numbered pens.

The term of the experiment will be two years.

The rations being fed on a weight basis are as follows :—

TABLE 1.

Pens.	Group.	Bran.	Pollard.	Wheat-meal.	Meat-meal.	Crushed Peas.	Wheat.	Crushed Oats.	Bone-meal.	Ground Lime-stone.	Salt.	Approx. Crude Protein.
		lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	%
1 and 2	I.	30	10	50	10	....	....	....	2	3	½	15·2
3 and 4	II.	30	10	....	10	....	30	20	2	3	½	15·0
5 and 6	III.	10	10	....	10	....	50	20	2	3	½	14·3
7 and 8	IV.	....	....	30	10	10	50	....	3	3	½	15·0
9 and 10	V.	....	....	....	10	....	90	....	3	3	½	13·8
11 and 12	VI.	....	....	....	10	....	60	30	3	3	½	13·5

CHANGE OF RATION GROUP II.

Shortly after commencing the experiments it was felt that more important information would be gained by substituting 20 lb. of crushed oats for 20 lb. of wheat in the ration fed to Group II. (refer Table I.).

It is unfortunate that this change eliminates the possibility of determining if whole wheat is an economical substitute for wheatmeal, but it does provide a means of obtaining further information on the economy of using oats as part of the grain fraction in the laying hens diet.

DIFFICULTIES EXPERIENCED IN FEEDING THE RATIONS.

A practical difficulty arose with the feeding of the meatmeal-bonemeal-ground limestone-salt mixture at a 16 per cent. level of the ration fed to the birds in pens 7–12 inclusive. (Refer Table I.). The solution should be of interest to readers.

During the initial period of the experiments the above mentioned mixture was mixed with the grain and the greater part of the rations in this form was placed in self-feeders where the birds partook of it, *ad lib.* Each morning a small quantity of the respective rations was damped and fed to the birds in each of the six pens.

Two problems became manifest.

1. The meatmeal-mineral mixture gradually separated out from the grain in the self-feeders and within a week or two the concentration of the meatmeal-mineral mixture in the bottom of the feeder was such that the birds were disinclined to eat from the hopper.

When the meatmeal-mineral mixture was fed separately in the dry form, the birds ate only 5 per cent. instead of the desired 16 per cent.

The problem was solved by damping the greenfeed which is fed each evening and mixing with it an appropriate amount of the meatmeal-mineral mixture.

This method of feeding the meatmeal is proving most satisfactory as the greenstuff is readily eaten and with it the meatmeal-mineral mixture at the desired level.

This problem recalls work carried out at the Victorian Government Experimental Farm at Werribee by W. O. Pederick and A. G. Clark. These workers found that meatmeals having a crude protein content of less than 60 per cent. were unpalatable to birds fed only whole grains and meatmeal. This probably accounts for the non-palatability of the meatmeal under question, samples of which have yielded an average crude protein content of 50 per cent. on a dry basis.

2. It was stated above that a small quantity of the respective rations was damped and fed to the birds in each of the six pens, 7–12 inclusive. While pens 1–6 inclusive eat their mash at the rate of half a kerosenetinful per 50 birds it was found that pens 7–12 inclusive could only manage one-eighth kerosenetinful of their damped grain ration each morning, and even then some of their grain ration was left in the troughs until late afternoon, by which time the meatmeal-mineral mixture had separated from the grain due to drying and was consequently left behind in the trough.

The feeding of the damped grain to birds in pens 7–12 inclusive has been discontinued with a consequent saving in labour. These birds now take their full grain ration from the self-feeders and their meatmeal-mineral mixture with the greenfeed as outlined above.

MOULT.

All pens moulted following the change on to the experimental rations. The moult was not severe and the birds comprising Group 1. were least affected. This was expected as the birds in this group were previously on a ration similar to the experimental ration. Generally speaking, the White Leghorns suffered more than the Australorps as a result of this change although pens seven and 11 were still showing signs of the moult during the first week in June.

By mid-June all the birds were through the moult but birds from pens 10 and 12 were slow to develop as indicated by their egg production at that time (*see* Graph II.).

SICKNESS, MORTALITIES, AND REPLACEMENT OF BIRDS.

The general health of the flock has been good. Pen six has been unfortunate in that it has lost a number of birds from a variety of causes. Colds were evident in this pen during July and August followed by a mild outbreak of chicken-pox during September. Mild colds were present amongst birds of the remaining five pens of White Leghorns during July and August.

To the 15th July, three and a half months after the commencement of the experiment, seven Australorps and 12 White Leghorns had died from a variety of causes such as :– internal laying, peritonitis, protusion of the oviduct with consequent cannibalism, fatty infiltration of the liver, etc., but no suspicion could be placed on the experimental rations as a possible cause of death. All these birds were replaced, so that on 15th July all pens were entire with 50 birds each. No replacements were made after this date.

Table 2 shows the number of birds left in each pen at the end of September.

TABLE 2.

Pen Number.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
No. of birds left in each pen at the end of September	49	50	50	49	50	43	50	47	48	50	50	50
No. of laying days lost by each pen through broodiness	135	45	90	15	90	15	75	15	120	15	60	30

MATURITY OF THE BIRDS.

Although the White Leghorns are only two weeks younger than the Australorps they were very much slower in coming into production and at the commencement of the experiments very few of the White Leghorns were laying, whereas the majority of the Australorps had been laying for a number of weeks. As Graph 2 shows, it was not until the beginning of July that the majority of the White Leghorns showed a satisfactory lay.

BODY DEVELOPMENT.

The experimental birds at the end of September were 12 months old and could then be regarded as mature.

TABLE 3.

Pen Number.	Average Body Weights at commencement of Experiment.	Average Body Weights at end of 6 months.	Mash and/or Grain Consumption.	Crude Protein Content of the Respective Rations.
	lb.	lb.	lb.	%
1	4·7	6·5	3,252½	15·2
2	3·0	4·5	2,520	15·2
3	4·9	6·3	3,280¾	15·0
4	3·0	4·0	2,416⅜	15·0
5	4·8	6·0	2,832½	14·3
6	3·0	3·9	1,946⅓	14·3
7	4·9	5·8	2,533¼	15·0
8	3·0	3·9	2,002	15·0
9	4·6	5·6	2,347½	13·8
10	3·0	3·6	1,877	13·8
11	4·9	5·6	2,540¼	13·5
12	2·9	4·0	2,279¼	13·5

From Table 3 we can arrive at the following conclusions :—

1. That the body weight increase of the birds under test has not been consistent.
2. That the body weight is apparently closely associated with food consumption.
3. That the general body weight may be associated with the protein content of the rations.

Two inconsistencies are obvious :—

1. In comparison of figures for pens five and seven, it can be seen that the high protein content of the ration fed to pen seven has evidently not been responsible for the average body weight increase that we would expect.

This can possibly be explained by the fact that the inclusion of peas in the ration fed to pen seven has contributed considerably towards its high protein content ; also the egg production from pen seven has been slightly higher than from pen five.

Complete knowledge of the influence of peas in regard to body building and egg production is not available.

2. The relatively good growth exhibited by birds from pen 12 might be partly explained by the fact that these birds have so far produced fewer eggs than any other pen, when their egg production is compared with that of the birds in pen four, which have the same average body weight, we find that pen four, by laying 2,546 eggs in six months has laid 703 more eggs than pen 12 for the same period.

More detailed work would be necessary to determine the exact influence of the proteins provided in these rations on body development, also the possibility of genetic factors influencing the development of the birds must not be overlooked in work of this kind.

BROODINESS.

For the first six months of the experiments, broodiness has not affected production to any extent. With summer fast approaching, this factor is sure to play an important part in reducing the number of " laying days " available to all pens, in particular those containing Austrlorps.

Experimental evidence and past records of Muresk Egg Laying Trials indicate that on the average, 15 " laying days " are lost when a fowl goes broody, provided that she is detected and placed in the " broody coop " early.

The approximate number of " laying days " lost by each pen during the first six months of the experiments and shown in Table 2, are worked out on this basis. At the first sign of broodiness the suspected bird is placed in an isolated coop with a slatted floor. She remains in this coop until signs of broodiness have left her, usually three to five days.

NESTING.

Nesting facilities in all pens are as illustrated in the accompanying photograph.

The birds are resting on a platform prior to entering the nests which can be seen in the background. Part of a dry mash hopper can be seen to the left. These hoppers are provided with conical tops to prevent the birds roosting on them at night.

Each nest is 16in. square. Six such nests serve the 50 birds in each pen. Each nest is fitted with a removable iron tray. Each tray contains clean, dry sand to a depth of approximately 2in. The use of this type of nest has resulted in few dirty and broken eggs. With this type of nest it is essential that inter-nest partitions be high enough to prevent a hen from one nest using her beak in an attempt to rob an egg from an adjacent nest.

In front of the nests a light wooden frame with wire-netting attached, is hinged so that it can be lowered to prevent the birds occupying the nests at night.

The nests being open front and back provide sufficient ventilation to keep the birds reasonably cool while on the nest during hot weather.

VALUE OF FOODSTUFFS CONSUMED.

Monthly retail prices of foodstuffs consumed by the experimental birds have been kindly supplied by Westralian Farmers Co-operative, Ltd. These prices were used in determining the cost of food consumed by each pen and shown in Tables 4 and 5.

TABLE 4.

Pen No.	Value of mash and/or grain consumed.	Value of green feed consumed.	Value of eggs laid.	Profit, value of eggs laid over total value of food consumed.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1	16 5 2½	1 2 10½	39 2 10½	21 14 9½
2	12 2 0½	1 2 10½	24 18 4	11 13 5
3	16 5 3	1 2 10½	24 18 4½	15 8 2¾
4	12 3 3¼	1 2 10½	20 8 7	7 2 5¼
5	14 19 9¾	1 2 10½	34 11 6	18 8 9¾
6	10 6 9	1 2 10½	18 11 4½	7 1 9
7	16 0 9¼	1 2 10½	36 4 11	19 1 3¼
8	12 16 5½	1 2 10½	18 12 2¾	4 12 10¾
9	12 18 8¾	1 2 10½	28 7 8½	14 6 1¼
10	10 6 8½	1 2 10½	15 12 6	4 2 11
11	14 9 1¾	1 2 10½	28 7 9	12 15 8¾
12	12 19 5¾	1 2 10½	14 17 9	0 15 4¾

Average prices for the various foodstuffs used over the six monthly period are as follows :—

	£ s. d.	
Wheat	0 6 6	per bushel
Feed oats (guyra)	0 4 5	per bushel
Meatmeal	15 15 0	per short ton
Field peas	0 16 6	per bushel
Bran and Pollard	0 1 6¼	per bushel
Bonemeal (100 lb. bags) ...	0 18 0	per bag
Ground Limestone	0 0 0½	per lb.
Salt	0 0 0½	per lb.

For the first three months of the experiments, 3d. per bushel was allowed to cover the cost of crushing the grain used in the rations. Today it would appear that 5d. per bushel is a more exact figure to work on, consequently as from 1st July and until further notice 5d. per bushel will be added to the price of all grain which is crushed before being fed.

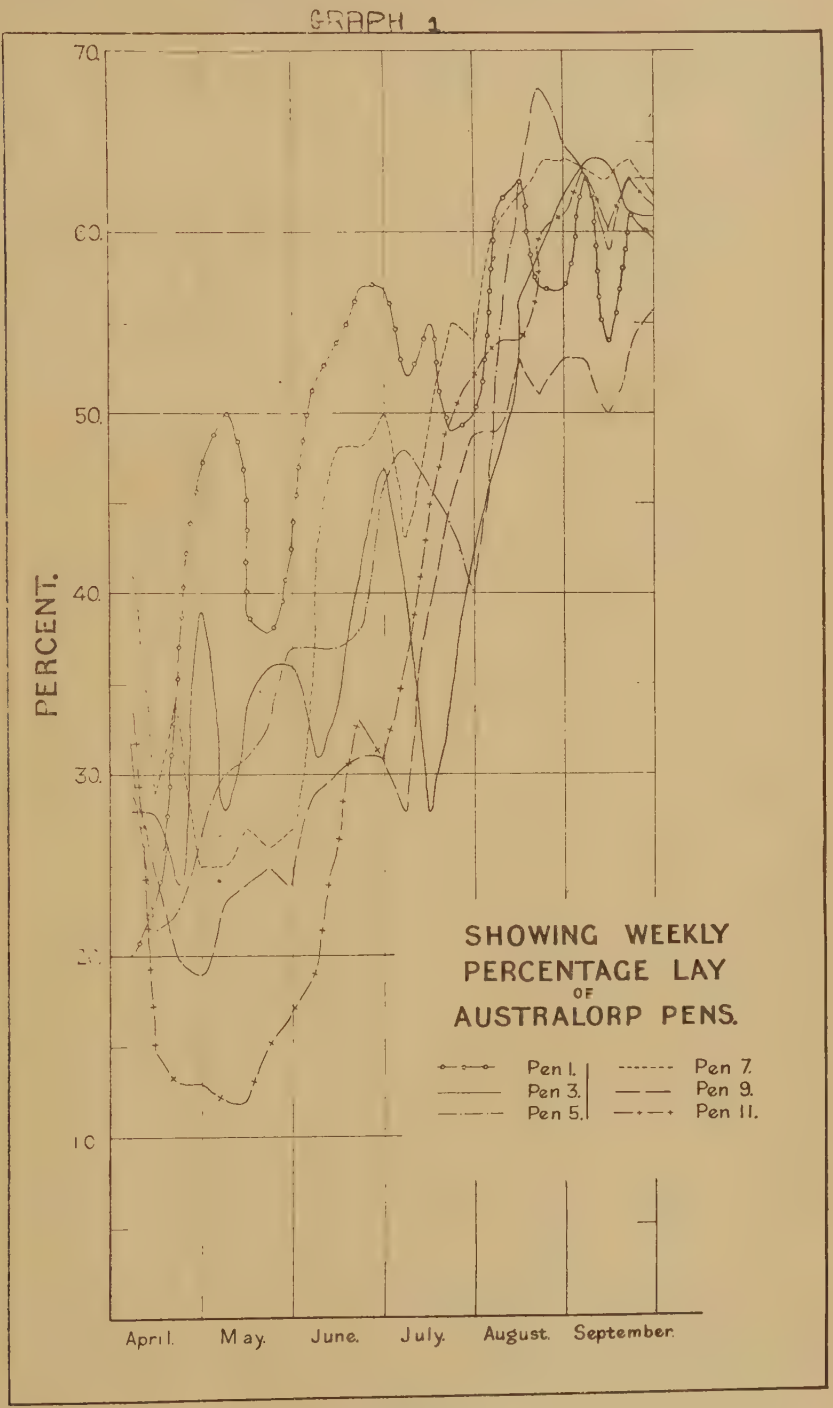
Table 5 shows the amount and value of foodstuffs consumed, the number of eggs laid and their value, also other information relating to the experiments which may be of interest to readers.

Table 5.

	Australorps.	White Leghorns.	All Pens.
No. of Birds	300	300	600
Mash and/or Grain consumed in lbs. ...	16,786¾	13,041½	29,828¼
Value of mash and/or grain consumed ...	£90 18s. 11d.	£70 14s. 8½d.	£161 13s. 7½d.
Green Feed consumed in lbs.	4392	4392	8784
Value of green feed consumed at 3d. per kerosene tin full (8 lbs.)	£6 17s. 3d.	£6 17s. 3d.	£13 14s. 6d.
Total food consumed in lbs. ...	21,178¾	17,433½	38,612¼
Total cost of food consumed	£97 16s. 2d.	£77 11s. 11½d.	£175 8s. 1½d.
Total food consumed per bird per day in ozs.	6·2	5·1	...
Total food cost per bird per week ...	3d.	2¾d.	...
Eggs laid in doz	1971	1163¼	3134¼
Value of eggs laid	£199 11s. 1½d.	£113 0s. 9¾d.	£312 11s. 10½d.
Cost of marketing these eggs at 3½d. per dozen	£28 14s. 10½d.	£16 19s. 3¾d.	£45 14s. 2d.
Profit over food cost	£101 14s. 11½d.	£35 8s. 9¾d.	£137 3s. 9d.
Profit over food and marketing costs ...	£73 0s. 0¾d.	£18 9s. 6¼d.	£91 9s. 7d.
Net profit per bird for 6 months on this basis	4s. 10¼d.	1s. 2¾d.	3s. 0½d.
Mash and/or grain consumed per egg laid in ozs.	11·3	14·9	12·7
Total food consumed per egg laid in ozs	14·3	19·9	16·4
Total food cost per dozen eggs laid in pence	11·9	16	13·4
Mash and/or grain consumed per bird per week in lbs.	2·1	1·7	1·9
Mash and/or grain consumed per bird per day in ozs.	4·8	3·9	4·3

When referring to Table 5, readers are reminded that due to the slow development of the White Leghorns under test, there was a big difference in the numbers of eggs laid by the two breeds under consideration, for the six months concerned.

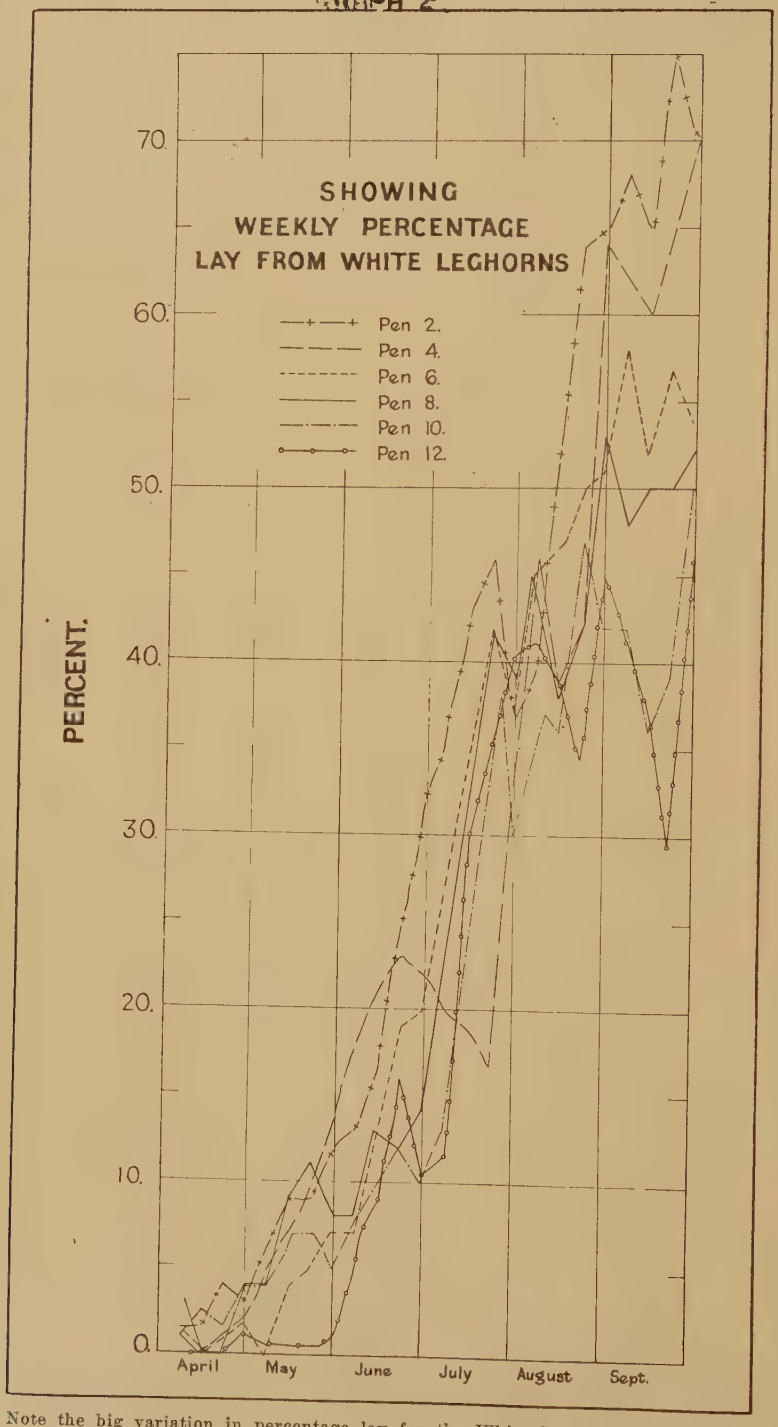
Comparison of graphs 1 and 2, show this difference and also that two pens of White Leghorns (Pens 2 and 4), were producing better than the best pen of Australorps at the end of September. It is highly likely that the production costs for the second six months for the two breeds will be much closer than for the first six months.



Graph I.

Note the initial falling off in production by all pens except Pen 1 following the change on to the experimental rations, also the loss of production to Pen 3 brought about by the change of ration fed this pen on 16th June. With the White Leghorns in Pen 4 (see Graph II.) production dropped in a similar manner.

GRAPH 2.



Note the big variation in percentage lay for the White Leghorn pens at the end of September. Compare this with the Australorps (Graph I.).

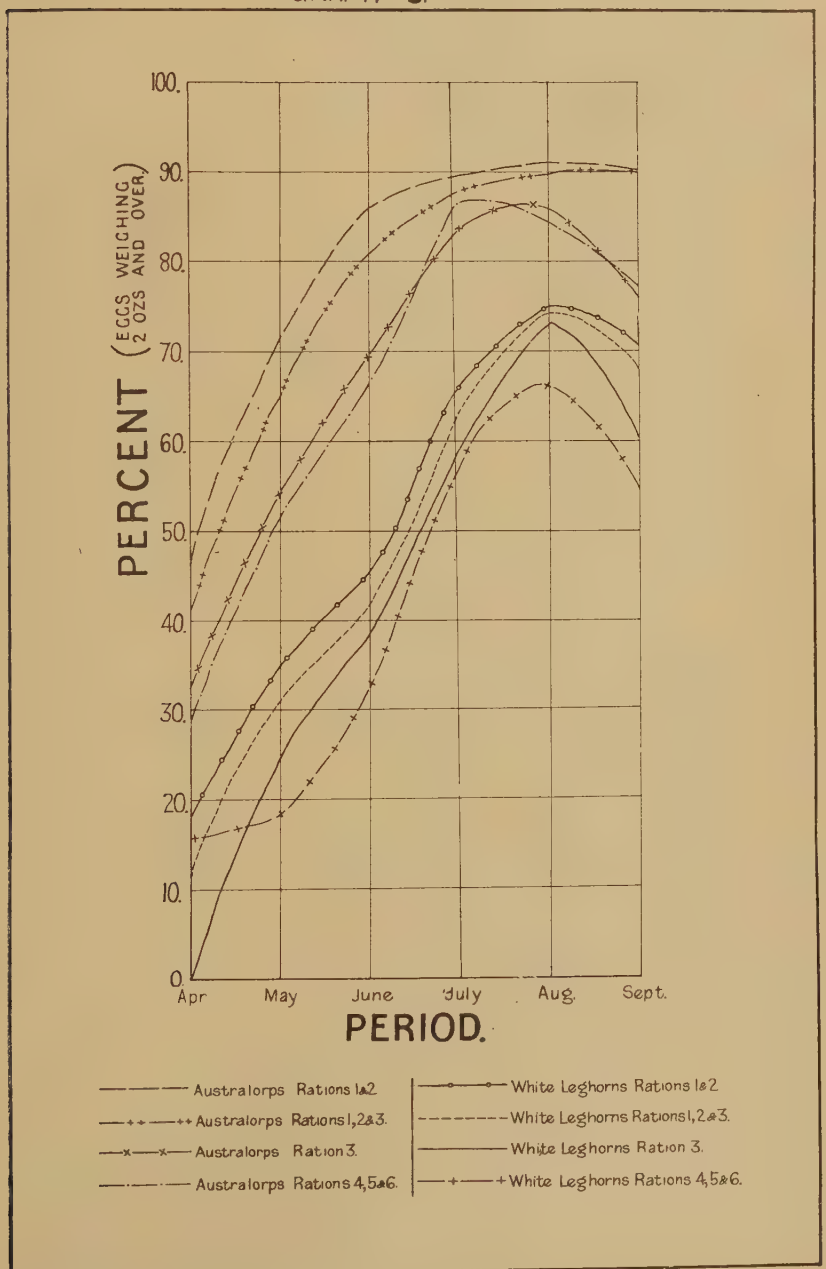
EGG SIZE.

From Graph 3 where the percentage of eggs weighing 2 oz. and over has been graphed with the period in which they were laid, it can be seen that with both breeds :—

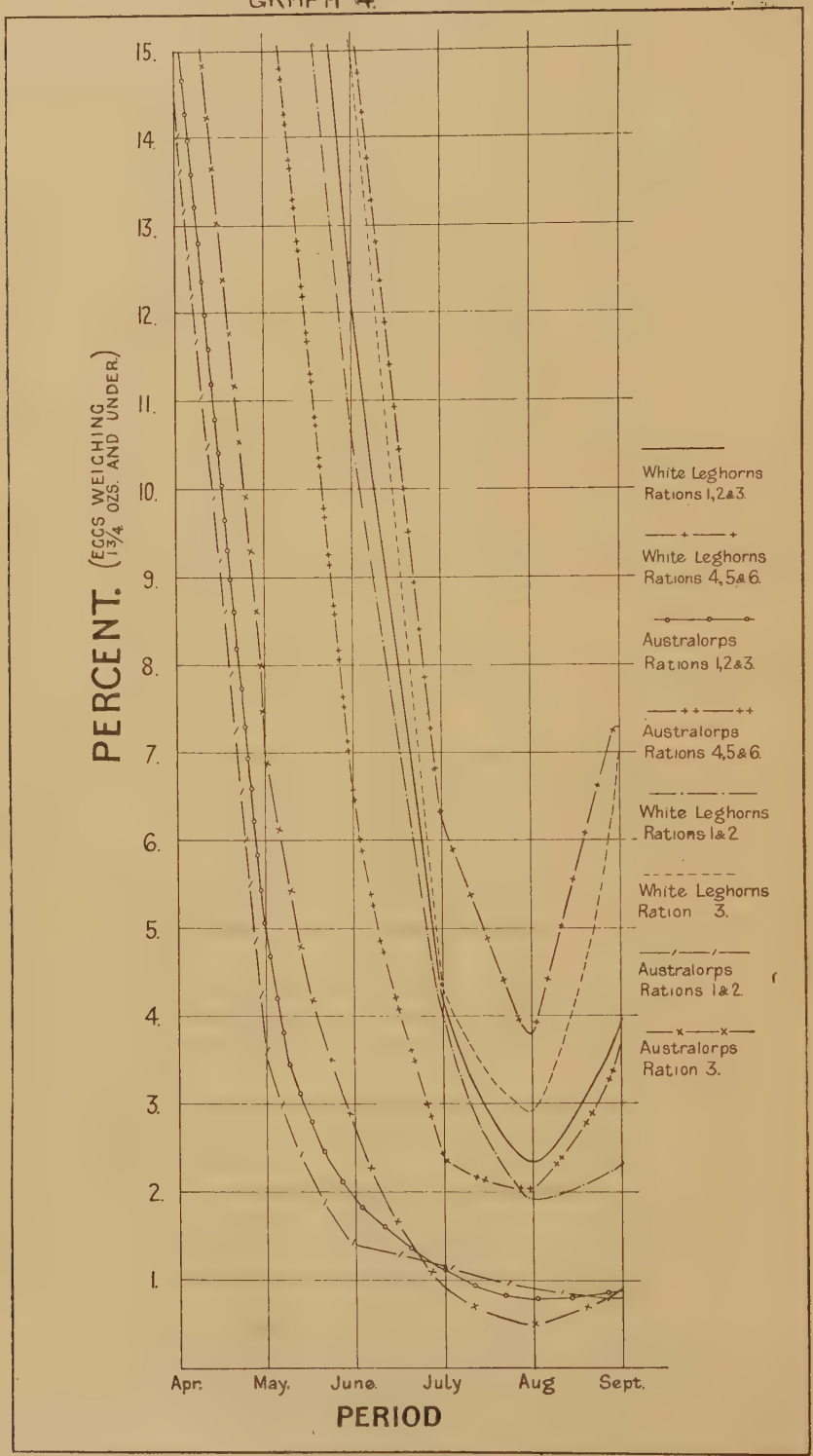
(a) Rations 1, 2 and 3 (*see* Table 1), produced a greater percentage of eggs weighing 2 oz. and over than did rations 4, 5 and 6.

(b) Rations 1 and 2 were superior to Ration 3 for the purpose of producing larger eggs.

GRAPH 3.



GRAPH 4.


PERCENT. (EGGS WEIGHING 13/4 OZS. AND UNDER)
15.
14.
13.
12.
11.
10.
9.
8.
7.
6.
5.
4.
3.
2.
1.
Apr.
May.
June.
July
Aug
Sept.
PERIOD
White Leghorns Rations 1,2&3.
White Leghorns Rations 4,5&6.
Australorps Rations 1,2&3.
Australorps Rations 4,5&6.
White Leghorns Rations 1&2
White Leghorns Ration 3.
Australorps Rations 1&2.
Australorps Ration 3.

These findings suggest that mill offal, when introduced into the ration, would result in an increase in egg size.

From Graph 4, where the percentage of eggs weighing $1\frac{3}{4}$ oz. and under has been graphed with the period in which they were laid, the conclusions support those drawn from Graph 3.

A reduction of 20% (by weight) bran in ration 3 as compared with Rations 1 and 2, resulted in a greater percentage of smaller eggs being laid by both Australorps and White Leghorns (Pens 5 and 6) on this ration. Actually the size of eggs laid by the fowls on Ration 3 is little in advance of that obtained from the group fed Ration 6, which consists mainly of wheat and crushed oats.

The exact influence that mill offal has on egg size could well be kept in mind for future investigation. In the meantime a trend of this is evident in the current experiments, the development of which will be interesting to follow.

THREE CLASSES OF SALEABLE EGGS.

1. Ninety-six per cent. of the eggs gathered that weighed $1\frac{3}{4}$ ozs. and over were regarded as "hen" eggs, "first grade."

2. The remaining 4 per cent. of the "hen" eggs were regarded as "second grade." Past Muresk egg laying records of individually penned fowls indicate that 2-3 per cent. of "hen" egs laid are sold as "second grade," under flock conditions, 4 per cent. would seem a reasonable figure to take.

3. All eggs weighing under $1\frac{3}{4}$ ozs. were regarded as "mediums."

VALUE OF EGGS LAID.

The value of eggs laid was based on wholesale prices ruling for the three classes of eggs listed above at the time of laying.

COST OF MARKETING EGGS.

Marketing charges per dozen eggs amount to approximately $3\frac{1}{2}$d. in the Metropolitan Area and $4\frac{1}{2}$d. in the country. Three and a half pence per dozen has been allowed to cover the cost in these experiments.

GENERAL.

It will be observed from the foregoing that the experiments have progressed for six months and it is proposed to continue them until March, 1949.

It is necessary to emphasise that the report given above is in respect of continuing experiments and the results shown should not therefore be taken as final.

It is possible that the conclusions arrived at may be considerably altered at the termination of these experiments.

ACKNOWLEDGMENTS.

Grateful acknowledgment is made to Messrs. K. Cowin, M. Johnson and P. Thomson for their ready co-operation in this work.

VETCHES

By I. THOMAS, Superintendent of Wheat Farming.

For many years field peas and lupins have been the only legume plant species which have been grown to any marked extent for grain purposes. Under certain conditions both these plants have some disabilities and endeavours have been and still are being made, to provide alternative legume species which will prove more successful under all types of conditions.

During 1945, a small quantity of each of five varieties of vetch obtained the previous year from the Hawksbury Agricultural College, Nec South Wales, as planted at the Avondale Reaearch Station. One of these vetches, designated by the number P4059, appeareed to be the most prolific and promising variety, and during 1946 a small area was planted and 170 lb. of seed harvested.

The 170 lb. of seed obtained was used to plant a 5 acre plot at Wongan Hills Research Station during the 1947 season, the seeding rate used being approximately one half bushel per acre. The seed was planted during May on an area of fallowed land, a good germination resulted and subsequent growth was satisfactory, and by the Spring, excellent returns were anticipated.

Harvesting was carried out during November, though some of the pods were immature, but as a certain amount of the seed had already shed, it was considered desirable to carry out this operation. Care was taken to see that the immature portion was dried before bagging.

The yield from the five acres was just over 34 bushels.

From this year's experience, it would appear that vetches are a relatively easy crop to cultivate, including harvest. For harvesting operations the ordinary header harvester, equipped with light iron crop lifters and with every other tooth taken out of the comb, was used.

This variety of vetch appears to have definite possibilities as a substitute crop for field peas as it is immune to attacks by the pea weevil and has a good measure of resistance to red mite. In another article in this issue of the Journal, the feeding value is discussed from which it would appear that it is a valuable addition to the sources of stock foods high in protein.

Being a legume its cultivation will materially assist in building up the soil fertility and could possibly be used to advantage in soil conservation work.

Further trials and plantings of this strain of vetch in different districts of the wheatbelt during the coming season will be watched and noted with considerable interest.

LATE OR IRISH BLIGHT OF POTATOES

W. P. Cass Smith, Government Plant Pathologist.

IRISH Blight, also referred to as Late Blight is the most destructive and spectacular disease of potatoes in many parts of the world.

The term Irish as applied to this disease relates to the devastating epidemic which in 1844 and 1845 destroyed potato crops in Ireland, and Western European countries. In Ireland famine resulted from the wholesale crop failures, and as a direct result, people died of starvation. political strife ensued, and emigration to America and other parts of the world commenced.

The disease, which is caused by a fungus *Phytophthora infestans,* is encouraged by warm muggy weather during the day, and relatively cool temperatures at night. Fortunately it has so far proved to be uncommon in Western Australia, as climatic conditions for its full development are seldom ideal for lengthy periods. Serious outbreaks in the past, have been confined mainly to the districts adjacent to Perth and have all occurred during the period August to mid November.

Explanation of Figures.

Fig. 1.—"Irish blight" of potatoes caused by *Phytophthora infestans.*

A, Potato leaf showing "Irish Blight."

B, Potato tuber showing the reddish-brown areas of dry-rot due to *Phytophthora infestans.*

C, Fruiting-branch of the fungus protruding from a breathing-pore in a potato leaf.

D, Formation of *zoospores* on germination of a *sporangium.*

E, Germination of spore under warm conditions by a germ-tube. (All parts of the fungus highly magnified.) (After Pittman).

SYMPTOMS.

Leaves, petioles, stems, blossom-stalks and tubers may be attacked. On the leaves, dead, brown or blackish more or less extensive, collapsed, water-soaked areas occur which usually commence near the margins of leaves and rapidly work inwards. (See Figs. 1A and 2.) If the weather conditions subsequently become hot and dry the dead areas may wither and dry up, but if humid conditions continue they

Fig. 2. Potato leaf showing symptoms of Irish Blight. (After Kirk.)

Fig. 3.—Potato tuber showing external and internal symptoms of Irish Blight (After McAlpine).

may rapidly rot away with the evolution of a characteristic offensive odour. Infection usually first takes place on the lower leaves. In warm muggy weather the disease advances very rapidly, and the entire tops may soon become blackened and collapsed (see Figs. 2 and 5), followed by a wet rot involving the stems as well as the foliage. If affected leaves are examined after being placed in a moist jar overnight, or even after a cold night in the field, great quantities of delicate white mould may be found on the under surfaces and especially along the margins between the dead and healthy tissue. This is composed of the spore-bearing bodies (*sporangiophores*) of the fungus which have grown out overnight through the *stomata* or breathing pores of the leaves. (See Fig. 1c.) The spores (*sporangia*) readily break away from the *sporangiophores,* and are carried in the dew, or by wind or rain, to the soil or neighbouring leaves or plants. On germination each *sporangium* produces a number of actively motile animal-like bodies called *zoospores*, which swim about in the moisture until in a favourable position to attack new areas. (See Fig. 1d.) Each then settles down, forms a cell-wall about itself, and pushes out a thread or *hypha* which proceeds by growth to penetrate the host, and subsequently extend the disease.

Fig. 4.—Section of potato leaf showing fungus within leaf and also method of production of fruiting bodies and *zoospores* by the fungus. (After Scribner).

Under high temperatures the *sporangium* may germinate directly by a germ-tube instead of forming *zoospores* (*i.e.*, it may function as a *conidium*.) (See Fig. 1E.) The threads of the fungus grow about between the cells of the host and absorb food materials by means of absorbing structures, called *haustoria*. (See Fig. 4.) So great are the demands on the host that death of the cells rapidly follows.

The disease may prove disastrous in two ways. Firstly, if attack comes early in the season the yield of tubers may be greatly reduced on account of the killing of the leaves and stems. Secondly, very serious loss may result from direct attack on the tubers themselves. *Sporangia* may be washed down into the soil by rains and dews, and on germination the *zoospores* may bring about direct infection of the tubers. A *dry or wet rot* may result according to the moisture and temperature conditions in the soil at the time. Where the soil is heavy, damp and warm, complete disintegration of the tubers may speedily result. Under conditions less favourable to the organism, the disorganisation and characteristic reddish-brown discoloration of the tissues may only occur to a depth of about ⅛in. to ¼in. (see Figs 1B and 3). In such cases the diseased tubers remain comparatively firm, but the surface may be slightly sunken and become somewhat purplish-black in colour. This *dry-rot* condition may be evident on digging or may only become clearly

Fig. 5.—Showing effect fo Bordeaux mixture in preventing attack by Irish Blight. Plants on left and right sprayed with Bordeaux; those in centre not sprayed. (After Duggar.)

apparent after some time in storage. Cool, well aerated, dry storage conditions materially check the dry-rot symptoms from further development, but if the conditions are damp, complete destruction of the whole stack may speedily follow. This is, of course, largely assisted by secondary organisms, which follow up the initial injuries caused by the *Phytophthora*.

The disease appears to be carried over from year to year by means of fungus-threads, which hibernate within affected tubers. When such tubers are planted the threads of the fungus (*mycelium*) grow up the developing shoots and, under

favourable conditions, produce the *sporangia,* thus starting the disease in the new season's foliage. If the mean day temperatures lie between about 70° and 74° F., the humidity is high, and the night temperatures fall to about 50° F. the blight may speedily attain epidemic form.

CONTROL OF IRISH OR LATE BLIGHT.

Although Irish Blight has proved uncommon in the past this state of affairs may not always continue. Should the climatic conditions ever become favourable for the disease for a week or so on end great damage might result. The growers should, therefore, be prepared to take action against the parasite should it make its appearance during warm, muggy weather.

1. The disease can be readily controlled by spraying with copper fungicides (see Fig. 5). Either *Bordeaux Mixture* (copper sulphate 4 lbs.; quick lime 4 lbs. or hydrated lime 6 lbs.; water 40 gals.), or *Burgundy Mixture* (copper sulphate 4 lbs., washing soda 5 lbs., water 40 gals.) are suitable.

The action of the spray is protective, not curative and hence the first application must be given *immediately* the disease appears in view of its capacity for rapid spread. Application should be repeated frequently, during weather conducive to its development, in order to keep the new growth covered with spray.

2. If the tops become badly attacked towards the close of the season and dry weather follows, the tubers should not be harvested till a week or more after the tops are dead, as the risk of extensive infection of the tubers, with subsequent rotting in storage, is then considerably reduced owing to the killing of the *sporangia* by the dry weather. Where only small areas are affected the tops should be cut away and burnt before the tubers are harvested.

3. If the tubers must be harvested shortly after attack, cutting away and burning the tops, combined with spraying of the soil with Bordeaux or Burgundy mixture before digging, will considerably reduce the percentage of affected tubers.

4. Care should be taken to keep the plants well hilled up, so as to prevent the *sporangia* readily reaching the tubers.

5. After digging, the potatoes should be kept in a cool dry place to reduce the rotting in storage to a minimum. Tubers stored at 40° F. or lower only rot very slowly, even if fairly badly attacked. **Never, on any account, place the leaves or stems of potato plants in the tops of the bags.**

6. Potatoes from a diseased crop should not be used for seed unless no others are available. In this case any showing brown discolouration on cutting should be culled out from the seed tubers and destroyed by boiling.

Fertilisers.

The following fertilisers have been registered at the Department of Agriculture under the Fertiliser Act, 1928, for the year commencing 1st November, 1947:—

Name of Fertiliser.	Reg. No.	Brand.	By whom Registered.	Nitrogen (N) as				Phosphoric Acid (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works or on Rail Perth.
				Nitrate.	Ammonia.	Blood and Bone.	Bone Dust	Water Sol.	Citrate Sol.	Acid Sol.	Total.	Sulphate.	Muriate.	
A.—MINERAL.														
1. NITROGENOUS.														
(*a*) *Nitrogen as Nitrate:*														
Nitrate of Soda	12	Mt. Lyell as M.L.	Cuming Smith & Mt. Lyell F.F. Ltd.	15·5	....	....	....	....	....	....	....	....	....	18 10 0 W
do. do.	24	C.S.M.L.	do. do.	15·5	....	....	....	....	....	....	....	....	....	18 10 0 W
do. do.	35	Sickle	do. do.	15·5	....	....	....	....	....	....	....	....	....	18 10 0 W
do. do.	39	Champion	R. Dundas Smith & Son	16·29	....	....	....	....	....	....	....	....	....	22 10 0 P
do. do.	48	Cresco	Cresco Fertilisers Ltd.	15·5	....	....	....	....	....	....	....	....	....	18 10 0 W
Sodium Nitrate	57	Fauldings	F. H. Faulding & Co.	16·00	....	....	....	....	....	....	....	....	....	1 17 4 P
(*b*) *Nitrogen as Ammonia:*														
Sulphate of Ammonia	5	I.C.I.A.N.Z.	Cuming Smith & Mt. Lyell F.F. Ltd.	....	20·5	....	....	....	....	....	....	....	....	18 0 0 W
Do. do.	51	Cresco	Cresco Fertilisers Ltd.....	....	20·5	....	....	....	....	....	....	....	....	18 0 0 W
Ammonium Nitrate	58	Fauldings	F. H. Faulding & Co.	....	30·00	....	....	....	....	....	....	....	....	3 5 4 P1
Sulphate of Ammonia	59	do.	do. do.	....	20·0	....	....	....	....	....	....	....	....	1 12 8 P1
2. PHOSPHATIC.														
(*a*) *Rock Phosphate.*														
Phosphate Powder														
(*b*) *Superphosphate.*														
Superphosphate 19%....	6	Mt. Lyell as M.L.	Cuming Smith & Mt. Lyell F.F. Ltd.	....	....	....	....	15·00	2·50	1·5	19·00	....	....	5 8 6 W
Do. 21%....	7	Do.	do. do.	....	....	....	....	17·00	2·5	1·5	21·00	....	....	6 1 0 W
Do. 19%....	14	C.S.M.L.	do. do.	....	....	....	....	15·00	2·5	1·5	19·00	....	....	5 8 6 W
Do. 21%....	15	do....	do. do.	....	....	....	....	17·00	2·5	1·5	21·00	....	....	6 1 0 W
Do. 19%....	28	Sickle	do. do.	....	....	....	....	15·00	2·5	1·5	19·00	....	....	5 8 6 W
Do. 21%....	29	Sickle	do. do.	....	....	....	....	17·00	2·5	1·5	21·00	....	....	6 1 0 W
Do. 19%....	42	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	....	....	....	15·00	2·5	1·5	19·00	....	....	5 8 6 W
Do. 21%....	43	Cresco	do. do.	....	....	....	....	17·00	2·5	1·5	21·00	....	....	6 1 0 W
(*c*) *Superphosphate and Minors.*														
Superphosphate and Zinc	22	C.S.M.L.	Cuming Smith & Mt. Lyell. F.F. Ltd.	....	....	....	....	16·00	2·25	1·5	19·75	Zinc 2·5	.... Manganese	7 1 5 W

FERTILISERS.—*continued.*

Name of Fertiliser.	Reg. No.	Brand.	By whom Registered.	Nitrogen (N) as				Phosphoric Acid (P_2O_5) as				Potash (K_2O) as		Cash Price per ton at Works or on Rail Perth.
				Nitrate.	Ammonia.	Blood and Bone.	Bone Dust.	Water Sol.	Citrate Sol.	Acid Sol.	Total.	Sulphate.	Muriate.	
Super and Manganese	50	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	....	....	....	14·4	2·1	1·3	17·8	....	5·75	9 17 1 W
Do. do.	66	C.S.M.L.	do. do.	....	....	....	....	14·00	2·00	1·5	17·5	....	3·8	10 3 4 W
Do. do.	67	Sickle	do. do.	....	....	....	....	14·00	2·00	1·5	17·5	....	3·8	10 3 4 W
Super and Copper Ore	23	C.S.M.L.	Cuming Smith & Mt. Lyell F.F. Ltd.	....	....	....	....	14·00	2·00	1·5	17·5	....	Copper 1·60	8 3 10 W
Super and Copper No. 1	27	C.S.M.L.	do. do.	....	....	....	....	16·00	2·25	1·5	19·75	....	1·25	9 16 10 W
Super and Copper Ore	34	Sickle	do. do.	....	....	....	....	14·00	2·00	1·5	17·5	....	1·60	8 3 10 W
Super and Copper Ore	44	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	....	....	....	14·00	2·00	1·5	17·5	....	1·60	8 3 10 W
Super and Copper	54	Cresco	do. do.	....	....	....	....	16·00	2·5	1·5	20·00	....	1·25	9 12 8 W
3. POTASSIC.														
(*a*) *Potash as Sulphate.*														
Sulphate of Potash	13	Mt. Lyell as M.L.	Cuming Smith & Mt. Lyell F.F. Ltd.	....	....	....	....	....	....	....	....	30·00	....	16 13 0 W
Do. do.	25	C.S.M.L.	do. do.	....	....	....	....	....	....	....	....	30·00	....	16 13 0 W
Do. do.	36	Sickle	do. do.	....	....	....	....	....	....	....	....	30·00	....	16 13 0 W
Do. do.	52	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	....	....	....	....	....	....	....	30·00	....	16 13 0 W
Do. do.	69	Chandler	The State (W.A.) Alunite Industry	....	....	....	....	30	....	....	....	....	....	24 0 0 W
(*b*) *Potash as Muriate.*														
Muriate of Potash	49	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	....	....	....	....	....	....	....	....	60·0	29 17 5 W
4. NITROGEN AND PHOSPHORIC ACID.														
Potato Manure No. 2.	9	Mt. Lyell as M.L.	Cuming Smith & Mt. Lyell F.F. Ltd.	....	3·5	....	....	11·75	2·00	1·5	15·25	....	....	8 16 3 W
Potato Manure "C"	18	C.S.M.L.	do. do.	....	3·5	....	....	11·75	2·00	1·5	15·25	....	....	8 16 3 W
Do. "C"	32	Sickle	do. do.	....	3·5	....	....	11·75	2·00	1·5	15·25	....	....	8 16 3 W
Do. "C"	47	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	3·5	....	....	11·75	2·00	1·5	15·25	....	....	8 16 3 W
5. NITROGEN, PHOSPHORIC ACID AND POTASH.														
Potato Manure "A"	8	Mt. Lyell as M.L.	Cuming Smith & Mt. Lyell F.F. Ltd.	....	2·5	....	....	10·00	1·75	1·25	13·00	5·00	....	10 3 4 W
Do. No. 3	10	do.	do. do.	....	3·50	....	....	9·5	1·5	1·25	12·25	5·00	....	10 15 8 W
Do. "A"	16	C.S.M.L.	do. do.	....	2·5	....	....	10·00	1·75	1·25	13·00	5·00	....	10 3 4 W
Do. "B"	17	do.	do. do.	....	3·5	....	....	9·5	1·5	1·25	12·25	5·00	....	10 15 8 W

(W) at Works. (P) at Perth. (P1) per cwt. at Perth.

Do. "A"	30	Sickle	do. do.	....	2·5	....	....	10·00	1·75	1·25	13·00	5·00	....	10 3 4 W
Do. "B"	31	Sickle	do. do.	....	3·5	....	....	9·5	1·5	1·25	12·25	5·00	....	10 15 8 W
Do. "A"	45	Cresco	Cresco Fertilisers (W.A.) Ltd.	....	2·5	....	....	10·00	1·75	1·25	13·00	5·00	....	10 3 4 W
Do. "B"	46	Cresco	do. do.	....	3·5	....	....	9·5	1·5	1·25	12·25	5·00	....	10 15 8 W
Orchard Manure ...	11	Mt. Lyell as M.L.	Cuming Smith & Mt. Lyell F.F. Ltd.	5·00	....	...	....	7·00	1·25	·75	9·00	5·00	....	12 10 0 W
Do.	19	C.S.M.L.	do. do.	5·00	....	....	....	7·00	1·25	·75	9·00	5·00	....	12 10 0 W
Do.	33	Sickle	do. do.	5·00	....	....	....	7·00	1·25	·75	9·00	5·00	....	12 10 0 W
Do.	53	Cresco	Cresco Fertilisers (W.A.) Ltd.	5·00	....	....	....	7·00	1·25	·75	9·00	5·00	....	12 10 0 W
Tomato Manure	20	C.S.M.L.	Cuming Smith & Mt Lyell F.F. Ltd.	....	3·5	....	....	6·00	·75	·75	7·5	12·00	....	13 3 4 W
Tobacco Fertiliser	21	C.S.M.L.	do. do.	3·30		....	....	9·00	1·5	1·00	11·5	5·7	....	11 7 7 W
6. MISCELLANEOUS.														
Fertiliser Tablets	60	Summit Growth	L. M. McLeod	....	4·1	....	....	7·00	1·2	·1	8·3	Potash 12·2 Potash Sulphate.	....	*
Liquid Manure	56	"Fauldings"	F. H. Faulding & Co., Ltd.	7·5		....	....	5·00	....	....	5·00	3·5	....	*
Liquid Fertiliser	2	Nightingale 10-10-5	Wigmores Ltd.	10·00	....	....	....	10·00	....	....	10·00	5·00	....	*
Plant Food	70	Dawn	Dawn Nurseries	5·23	....	....	....	11·21	1·41	1·46	14·08	Less than 1·00	....	‡
B. ORGANIC														
(*a*) *Blood and Bone:*														
Blood and Bone ...	3	Wyndham	Wyndham Meat Works	6·00	....	....	....	....	6·5	9·00	15·5	....	....	13 6 0 P
Do. do.	4	K.A.A Surprise	C. A. Kirkby & Sons	5·5	....	....	....	....	4·00	10·00	14·00	....	....	15 8 6 P
Do. do.	26	C.S.M.L.	Cuming Smith & Mt. Lyell F.F. Ltd.	5·00	....	....	....	....	....	12·00	12·00	....	....	11 7 0 W
Animal Fertiliser	40	State Abattoirs Kalgoorlie	State Abattoirs F.F. Ltd.	....	....	8·0	....	....	....	5·00	5·00	....	....	16 0 0 W
Do. do.	41	State Abattoirs, Midland Jct.	do. do.	....	....	8·0	....	....	....	5·00	5·00	....	....	9 5 0 W
Blood with Bone	61	Ancho	Anchorage Butchers Ltd.	....	....	7·5	....	....	2·6	8·8	11·4	....	....	13 15 6 P
Blood and Bone	62	Robbs	The W.A. Meat Export Works	....	....	....	....	....	....	14·00	14·00	....	....	10 11 2 W
Do. do.	63	Eclipse	Do. do.	....	....	....	....	....	....	12·00	12·00	....	....	10 16 8 W
Do. do.	64	Albany Eclipse	The W.A. Meat Export Works (Albany Branch)	....	....	6·0	....	....	....	....	12·00	....	....	10 16 8 W
Do. do.	65	Apollo	J. Kitchen & Sons Pty., Ltd.	....	....	7·0	....	....	9·0	5·0	14·00	....	....	
(*b*) *Bone Dust.*														
General Purpose Bone Dust	1	Wattle	Wattle Fertiliser Co.	3·43	....	....	....	....	....	....	20·57	....	....	
(*c*) *Miscellaneous:*														
Super Humus No. 2	37	Superhumus	William Austen	4·00		....	....	3·0	·5	6·5	10·00	....	....	*
Do. No. 1	38	do.	do. do.	2·00		....	....	1·8	·5	·2	2·5	2·00	....	*
Garden Manure	55	Sproutem	Kog Manufacturing Co.	....		....	5·0	....	5·00	4·00	9·00	....	....	*
Fish Fertiliser	68	Cormo	Norwest Fertilisers	5·00		....	....	....	....	....	8·00	....	....	*

(W) at Works. (P) at Perth. † C.I.F. & E., Fremantle. * Price on Application. ‡ Contains minor elements.

Western Australia

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